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Mariners Weather Log

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Mariners Weather Log

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Front Cover: Heavy surf pounds the beach and pier at Wrightsville Beach, North Carolina from hurricane Diana. Diana made landfall just south of here, early on the 13th, when this photograph was taken. Wide World Photo.

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The Secretary of Commerce has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through April 1, 1985.

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Mariners Weather Log

NORTH ATLANTIC TROPICAL CYCLONES, 1984

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AND
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Tropical cyclone activity returned to near normal during 1984 after two rather quiet seasons. There were twelve named tropical cyclones and one subtropical storm. Five reached hurricane force and the remaining systems were of storm strength. Table 1 is a listing of this year's storms along with dates, maximum sustained winds and minimum pressure. For comparison, the long-term average is ten named storms per year, out of which six attain hurricane status. Tables 2 and 3 summarizes data since 1931.

Figure 1 shows this year's tracks. Most of this season's activity was concentrated in the Atlantic. Tropical storms Arthur, Bertha, Fran and Gustav can be traced to disturbances that came off the African continent. The remaining storms and hurricanes formed by developing along old frontal zones in association with upper-level troughs of low pressure. An exception was hurricane Klaus, a slow-developing, late-season system that formed from a broad area of disturbed weather in the Eastern Caribbean Sea.

The GOES-East geostationary satellite which provided the primary meteorological satellite coverage of the Atlantic Ocean failed at the end of July. It was indeed fortunate that the tropics remained quiet until late August. By then, the GOES-West satellite had been shifted eastward to partly compensate for the missing satellite coverage.

Because many of this season's tropical cyclones were large and displayed erratic tracks across the shipping lanes, more than 160 ship

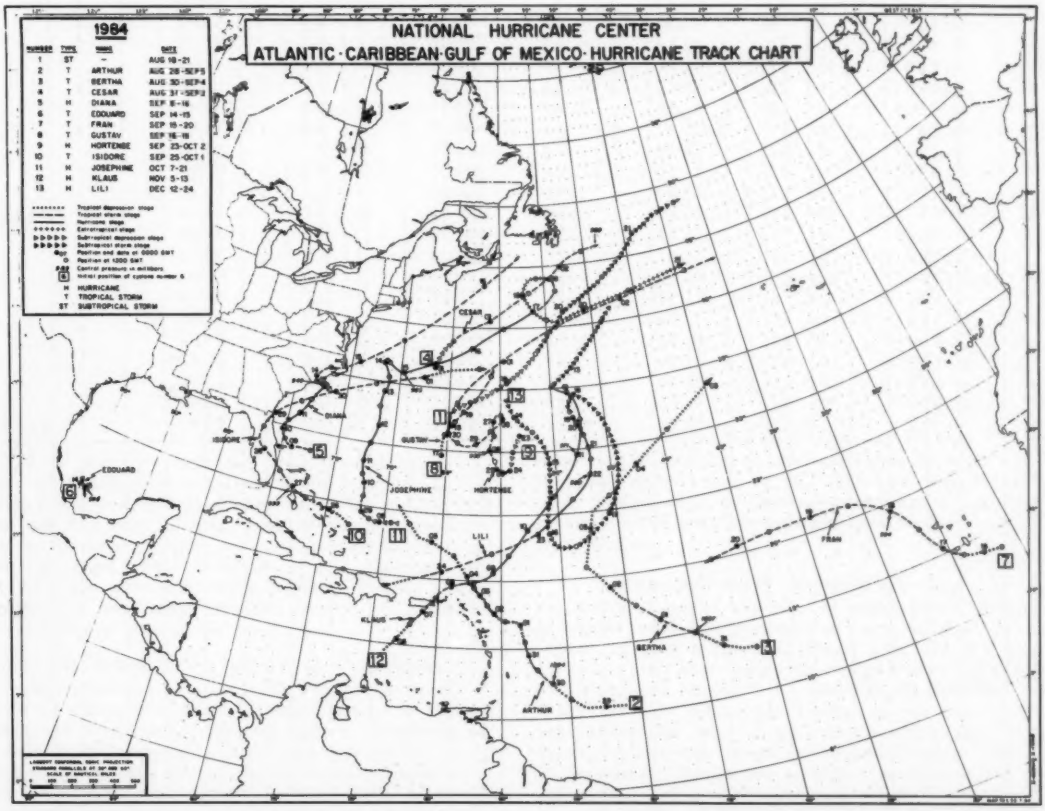

Figure 1.— North Atlantic tropical cyclone tracks, 1984.

Table 1.-- Tropical cyclone statistics, 1984

no.	name	class.[1]	dates[2]	maximum sustained wind (kt)	lowest press. (mb)	U.S. damage ($millions)	deaths
1	-	ST	8/18- 8/21	50	1000		
2	Arthur	T	8/28- 9/05	45	1004		
3	Bertha	T	8/30- 9/04	35	1007		
4	Cesar	T	8/31- 9/02	50	989		
5	Diana	H	9/08- 9/16	115	949	65	3
6	Edouard	T	9/14- 9/15	55	998		
7	Fran	T	9/15- 9/20	55	994		
8	Gustav	T	9/16- 9/19	45	1006		
9	Hortense	H	9/23-10/02	65	993		
10	Isidore	T	9/25-10/01	50	999	1	1
11	Josephine	H	10/07-10/21	90	965		
12	Klaus	H	11/06-11/13	80	971		
13	Lili	H	12/12-12/24	70	980		

[1] T: tropical storm, wind speed 34 - 63 kt.
H: hurricane, wind speed 64 kt or higher.
ST: subtropical storm, wind speed 34 - 63 kt.

[2] The day begins at 0000 GMT.

Table 2.-- Frequency of tropical cyclones by months and years

		May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1931			1	1	2	3	1	1		9
1932		1			3	3	3	1		11
1933		1	1	3	7	5	3	1		21
1934		1	1	1	2	2	3	1		11
1935					3	1	2			6
1936			3	2	6	4	1			16
1937				1	2	6				9
1938					3	1	3	1		8
1939			1		1	1	2			5
1940		1			3	2	2			8
1941						4	2			6
1942					3	3	3	1		10
1943				1	2	4	3			10
1944				3	2	4	2			11
1945			1	1	4	3	2			11
1946			1	1	1	1	2			6
1947				1	2	3	3			9
1948		1		1	2	3	1	1		9
1949					3	7	2	1		13
1950					4	3	6			13
1951		1			3	4	2			10
1952	(Feb)1				2	2	2			7
1953		1			3	4	4	1	1	14
1954			1	1	2	4	1	1	1	11
1955				1	4	5	2			12
1956			1	1	1	4	1			8
1957			2		1	4	1			8
1958			1		4	4	1			10
1959		1	2	2	1	3	2			11
1960			1	2	1	3				7
1961				1		6	2	2		11
1962					2	2	1			5
1963				1	1	5	2			9
1964			1	1	4	4	1	1		12
1965			1		2	2	1			6
1966			1	4	1	4		1		11
1967					1	4	3			8
1968			3		1	3	1			8
1969				1	5	6	5	1		18
1970		1		1	3	3	2			10
1971				1	4	6	1	1		13
1972		1	1		2	2		1		7
1973				2	2	2	2			8
1974			1	1	4	4	1			11
1975			1	1	2	3	1		1	9
1976		1		1	5	2	1			10
1977					1	3	2			6
1978	(Jan)1			1	4	3	3			12
1979			1	2	3	2	1			9
1980					3	5	1	2		11
1981		1	1		2	5	1	1		11
1982			1		1	2	1			5
1983					2	2				4
1984					4	6	1	1	1	13
1985										
Totals	(Jan)1 (Feb)1	12	29	41	136	186	96	21	4	527

reports of 35 kn winds or higher were received at the National Hurricane Center. About 20 percent of the ship reports indicated winds of 50 kn or more. Table 4 is a list of these vessels.

SUBTROPICAL STORM, AUGUST 18-21

A low pressure area formed in a weak frontal trough near Bermuda on 18 August and became a subtropical storm 36 hr later as it moved rapidly northeastward through the shipping lanes. The ship DIADEMA (PJKE) reported winds of 150 degrees at 40 kn and a surface pressure of 1003.9 mb at 0000 on 20 August near 41.2°N and 53.0°W. This report allowed a "calibration" of the satellite estimates of the system's strength. The storm was estimated to have winds of 50 kn during the 20th, then it weakened and merged with a frontal trough on 21 August.

TROPICAL STORM ARTHUR, AUGUST 28 - SEPTEMBER 5
TROPICAL STORM BERTHA, AUGUST 30 - SEPTEMBER 4

Table 3.-- Frequency of hurricanes by months and years

Frequency of Tropical Cyclones Reaching Hurricane Intensity by Months and Years

	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1931					2				2
1932				3	1	1	1		6
1933		1	1	3	3	1			9
1934		1	1	1	1	1	1		6
1935				2	1	2			5
1936		1	1	3	2				7
1937					3				3
1938				2	1				3
1939				1		2			3
1940				3	1				4
1941					3	1			4
1942				3			1		4
1943			1	1	2	1			5
1944			2	1	3	1			7
1945		1		1	1	2			5
1946			1		1	1			3
1947				2	1	2			5
1948				1	3	1	1		6
1949				2	4	1			7
1950				4	3	4			11
1951	1			2	3	2			8
1952				2	2	2			6
1953				2	3	1			6
1954		1		2	3	1		1	8
1955				3	5	1			9
1956			1	1	1	1			4
1957		1			2				3
1958				3	3	1			7
1959		1	2		3	1			7
1960			1	1	2				4
1961			1		5	1	1		8
1962				1	1	1			3
1963			1	1	4	1			7
1964				2	3	1			6
1965				2	1	1			4
1966		1	3	1	1		1		7
1967				1	3	2			6
1968		2		1	1	1			5
1969				4	4	3	1		12
1970	1			1	1	2			5
1971				2	4				6
1972		1		1	1				3
1973			1	1	1	1			4
1974				2	2				4
1975			1	2	3				6
1976				4	1	1			6
1977				1	3	1			5
1978				2	2	1			5
1979			1	2	2				5
1980				3	3	1	2		9
1981				1	5		1		7
1982		1			1				2
1983				2	1				3
1984					2	1	1	1	5
1985									
Totals	2	12	19	86	118	50	11	2	300

Table 4.-- Ships encountering tropical cyclone winds of 50 kn or more in the North Atlantic, 1984

TROPICAL CYCLONE	VESSEL CALL SIGN	DATE MO	DAY	TIME GMT	SHIP POSITION LAT. °N	LONG. °W	WIND DIR. 0°	SPEED (KN)	PRESSURE (MB)
ARTHUR (None)									
BERTHA (None)									
CESAR	WGZL	09	02	1800	46.7	48.5	07	50	990.8
	VSBC	09	02	1800	46.6	48.0	08	50	991.0
DIANA (None)									
EDOUARD (None)									
FRAN (None)									
GUSTAV (None)									
HORTENSE	KSLB	1001		1200	40.0	53.7	17	50	998.0
ISIDORE (None)									
JOSEPHINE	GSPA	10	09	1800	27.6	71.9	09	50	1003.3
	GSPA	10	10	0000	27.6	73.2	02	60	1002.4
	PPEB	10	10	1800	26.5	69.7	17	50	1009.8
	LRQU	10	11	1800	32.8	69.4	21	75	1014.9
	ERQU	10	12	0100	34.7	71.6	12	75	1011.6
	PEBD	10	12	2100	36.2	71.7	05	50	1011.0
	3ELE	10	14	0000	37.8	73.7	02	50	---
	WEZU	10	14	1200	35.0	72.3	28	55	992.8
	WEZU	10	14	1800	35.3	72.6	30	65	990.5
	VCNP	10	16	1200	43.4	61.1	03	50	1004.5
	DCKE	10	16	1800	42.7	56.0	04	80	---
	OWCY	10	16	1800	42.5	56.6	05	50	988.0
	DCKE	10	17	0000	42.7	57.0	05	65	---
	GGDG	10	17	0000	43.3	58.6	03	55	---
	VCNP	10	17	0000	43.6	61.0	01	50	1012.5
	KMHF	10	17	0000	44.7	58.0	03	50	1008.2
	GZCM	10	17	0600	44.9	53.9	05	50	1001.0
	KMHF	10	17	0600	44.6	58.0	03	50	1008.5
	GZCM	10	17	1200	45.0	55.3	03	60	1004.1
	FNLO	10	17	1200	46.0	52.3	06	50	1011.0
	KMHF	10	17	1200	44.0	53.0	01	50	1009.0
	GZCM	10	17	1800	45.3	56.7	02	50	1006.5
	FNLO	10	18	0000	46.5	55.2	06	50	1008.5
	ELDA	11	07	1800	22.0	60.4	12	50	999.1
KLAUS	ELDA	11	08	0600	24.0	58.5	11	60	999.6
	GUSG	11	11	0000	32.5	57.0	03	50	1001.7
	GCPZ	11	11	0600	33.0	56.0	01	50	997.0
	DCDV	11	11	1200	32.8	55.6	35	50	1004.0
	GNAG	11	11	1800	35.5	54.2	01	60	992.6
	VPJS	11	11	1800	38.0	45.5	08	55	1012.5
	GCPZ	11	12	0600	34.8	56.8	36	70	990.1
	SPPK	11	12	0600	32.5	50.5	19	60	1002.0
	GCPZ	11	12	1200	35.2	57.0	36	50	988.3
	SPPK	11	12	1200	32.5	50.0	19	50	1008.0
LILI	GUEP	12	20	1200	30.8	52.8	26	63	982.1

Both storms originated from African waves east of the Lesser Antilles in late August. Arthur was a tropical storm for 48 hr and Bertha was one for only 24 hr. A strong upper level westerly shearing pattern contributed to the lack of significant development and eventual dissipation at sea of both storms. During the short time they were tropical storms, there were no ships near their centers.

TROPICAL STORM CESAR, AUGUST 31 - SEPTEMBER 2

An organized cloud system located several hundred miles off the southeastern United States coast on 30 August developed into a low-pressure system with tropical characteristics by 31 August. For the next 2 days, as Cesar moved northeastward well to the south of Nova Scotia, more than a dozen ships reported gale-force winds and pressures below 1000 mb. There was very little satellite data available in this area due to the loss of the GOES-East satellite. Cesar merged with an extratropical low-pressure system to the east of Newfoundland on 2 September.

HURRICANE DIANA, SEPTEMBER 8-16

A weak frontal trough, in combination with an upper-level low pressure system, gradually organized into a tropical storm just off the upper Florida east coast on 8 September. Winds of 40 kn were reported by the SEALAND VENTURE (KLJH) east of Jacksonville during the day, indicating the area of gale-force winds was expanding and the storm was strengthening. By 10 September, Diana had become a hurricane and was moving north-northeastward parallel to the Georgia and South Carolina coasts. Over the next 2 days, Diana continued to strengthen and

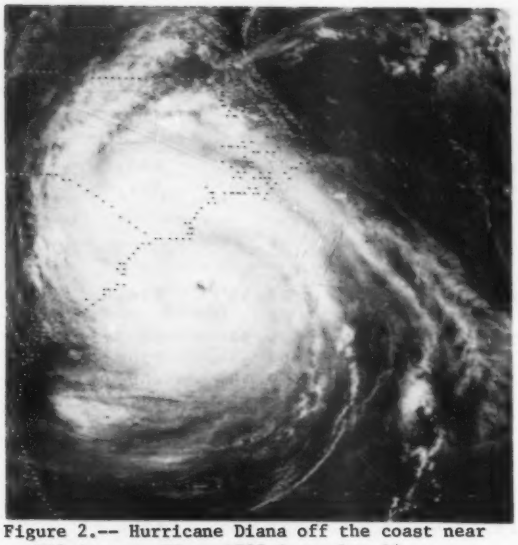

Figure 2.-- Hurricane Diana off the coast near Wilmington, NC at 1700 September 11.

Figure 3.-- Boats damaged by hurricane Diana at Carolina Beach, NC. Wide World Photo.

reached an estimated maximum intensity of 115 kn just off the southeasten North Carolina coast by late on 11 September (fig.2).

After looping and losing strength, the

Figure 4.-- A resident surveys the damage after Diana struck Long Beach, NC earlyon the 13th. Wide World Photo.

center moved onshore near Wilmington, North Carolina, on the 13th (fig. 3 and 4). Because of the close proximity of the coast and the strength of Diana, few ship reports were received in the area of the storm after 9 September (fig. 5). Diana turned sharply to the northeast and moved offshore as a tropical storm on 15 September. It accelerated to a position off the Canadian Maritime Provinces by the 16th and lost tropical characteristics.

TROPICAL STORM EDOUARD, SEPTEMBER 14-15

A stationary low pressure area over the extreme southwest Gulf of Mexico persisted for several days prior to the formation of tropical storm Edouard on 14 September. The storm hovered off the Mexican coast for 2 days with reconnaissance aircraft indicating maximum winds of 55 kn on the 15th. Edouard quickly weakened and its remnants moved inland near Vera Cruz on 16 September. Edouard was a very small system in a sparse data area. As a consequence, no ship observations were received in the vicinity of the storm.

TROPICAL STORM GUSTAV, SEPTEMBER 16-19

A tropical disturbance, steered northward by a major trough in the westerlies, developed into a depression near Bermuda on 16 September. On 18 September, it became tropical storm Gustav, then merged with a frontal trough northeast of Bermuda within 24 hr of being named. The storm was quite small and gale

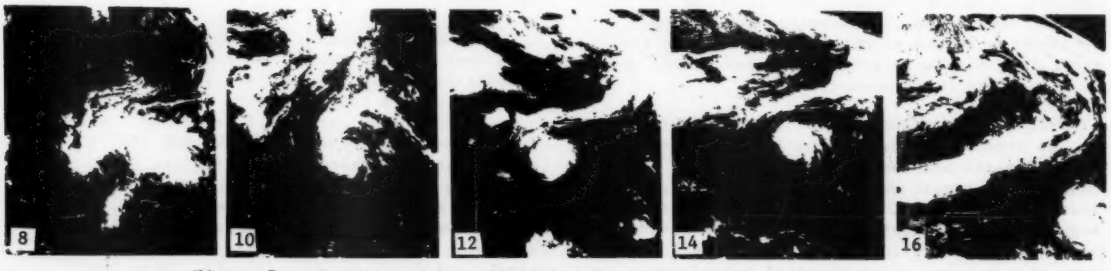

Figure 5.-- Hurricane Diana September 8 to 16 in 2 day increments.

force winds reported by several ships in the area were mainly due to interaction with high pressure to the north of the storm.

HURRICANE HORTENSE, SEPTEMBER 23 - OCTOBER 2

A broad low pressure area formed in a frontal cloud band east of Bermuda on 23 September and drifted southward until 24 September, when reconnaissance aircraft confirmed that it was a tropical storm. Hortense turned westward and then moved slowly northward and briefly attained hurricane status on 25 September with aircraft observing a maximum wind of 70 kn and a surface pressure of 993 mb. The weakening storm then made a loop east of Bermuda on 27-28 September (fig.6) and passed almost directly over the island on the 30th. Thereafter, Hortense weakened and accelerated on a northeast to east track, gradually losing tropical characteristics. Hortense then merged with a strong extratropical low which later caused considerable damage and some casualties along the coast of France and Spain (some newspapers reported this as being directly attributable to Hortense). On Hortense's prolonged journey through the mid Atlantic, numerous ships reported winds of gale force or higher. The SEALAND PACER (KSLB) was very near the center at 1200 on 1 October when she reported winds of 170 degrees at 50 kn and a pressure of 998.0 mb.

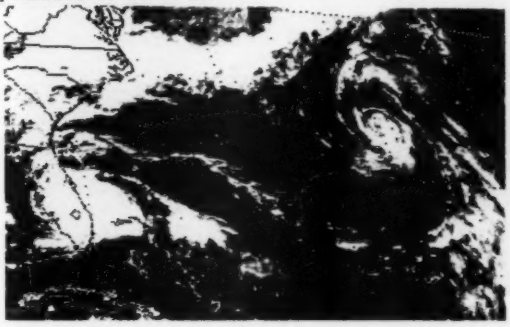

Figure 6 & 7.--Tropical storms Hortense east of Bermuda and Isidore over Florida at 1830 September 27.

TROPICAL STORM ISIDORE, SEPTEMBER 25 - OCTOBER 1

A depression formed on 25 September just east of the Bahamas, near the west end of a nearly stationary frontal zone. The next day reconnaissance aircraft and weather reports from the Bahamas indicated Isidore had reached tropical storm status in the central Bahamas. Isidore continued moving toward the west-northwest and made landfall just north of Palm Beach, Florida, on 27 September (fig.7). Maximum sustained winds were near 50 kn just prior to landfall. The storm recurved over northern Florida on the 28th and moved offshore near Jacksonville on the 29th. Isidore attained maximum winds of 50 kn again on the 30th as the storm accelerated toward the east-northeast into the Atlantic. It merged with a frontal zone several hundred miles north of Bermuda on 1 October. More than ten ships reported winds of 35 to 45 kn in association with this storm.

HURRICANE JOSEPHINE, OCTOBER 7-21

On 7 October, a broad and diffuse low pressure area formed east of the Bahama Islands in a similar fashion to the development of tropical storm Isidore 12 days earlier. Reconnaissance aircraft reports indicated that the system became tropical storm Josephine during 8 October as it gradually turned to a northerly track. Josephine became a hurricane on 11 October and continued slowly northward (fig. 8) until 14 October. It then turned sharply toward the east and continued on a steady east to northeast course until 17 October. During 18-19 October, Josephine looped several hundred miles south of Newfoundland and gradually lost its tropical character as it merged with a high latitude trough on 21 October.

Josephine was a large and long-lived storm. It affected the major shipping lanes of the North Atlantic for an extended period of time. More than 25 ship reports received were in excess of 50 kn over a period of 9 days. Five of these ships reported winds of hurricane force extending over a period of 6 days. The highest

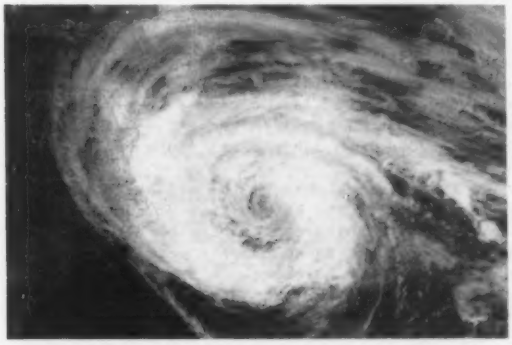

Figure 8.-- Hurricane Josephine east of Cape Hatteras, NC at 1530 October 13. NOAA Image.

ship reported wind was 80 kn on 16 October. This compares with the highest sustained wind of 90 kn measured by reconnaissance aircraft 4 days earlier.

The combination of hurricane Josephine and the large high-pressure system to the north, while the storm was moving slowly parallel to the United States east coast, created strong winds over an extensive area. The winds, combined with abnormally high astronomical tides and large waves, produced damage to marine installations and caused severe beach erosion from the Outer Banks of North Carolina northward to Massachusetts.

HURRICANE KLAUS, NOVEMBER 6-13

As early as 3 November, there were signs that something unusual was happening in the eastern Caribbean Sea. Surface winds were out of the west to northwest along the north coast of Venezuela, indicating that a low pressure system was developing. On the afternoon of 6 November, reconnaissance aircraft reported gale-force winds and a surface pressure of 1002 mb, showing that tropical storm Klaus had formed. Klaus moved on an unusual track toward the

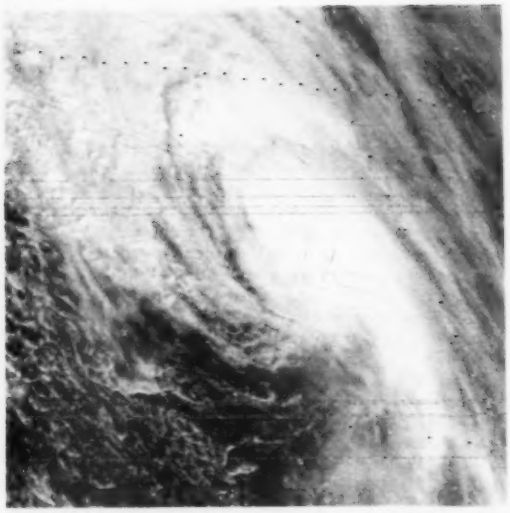

Figure 9.-- Hurricane Klaus northeast of Puerto Rico near 27°N, 54.5°W at 1500 November 10. NOAA Image.

northeast with its center passing between Puerto Rico and the Virgin Islands on 7 November. Shortly thereafter, Klaus became a hurricane and remained one until the 12th when it weakened and was downgraded to a subtropical storm on 13 November.

On Klaus's trek through the mid-Atlantic, the large size of the storm (fig. 9) contributed to more than 40 ship reports of gale-force winds. Over 30 of these reports were during the 3 day period 10-12 November. A few ships encountered hurricane force winds during this period.

The unusual northeasterly track and large wind field associated with Klaus caused strong southwesterly winds to affect the Virgin and northern Leeward Islands for several days. This produced onshore gales and rough seas on the usually protected south and west side of these islands. On the island of St. Martin, 31 yachts were beached with 7 destroyed. Some of the major docks on the protected southwest side of the island were heavily damaged. Eighty-three people aboard the Yankee Clipper WINDJAMMER had to abandon ship when it broke loose from its anchorage a mile off St. Martin on 8 November. No one was injured seriously, but the passengers and crew battled 50 mph winds and 12-ft seas to reach shore. It has been reported that a large cruise ship wrecked several boats and damaged dock facilities in the Virgin Islands.

HURRICANE LILI, DECEMBER 12-24

Hurricane Lili is only the third hurricane of record (since 1871) to form in the month of December. The first known hurricane occurred in the Atlantic in 1887. In 1954, hurricane Alice, the second December hurricane, formed in the same general area as Lili with a somewhat similar track. Figure 10 shows Lili's rather complicated track.

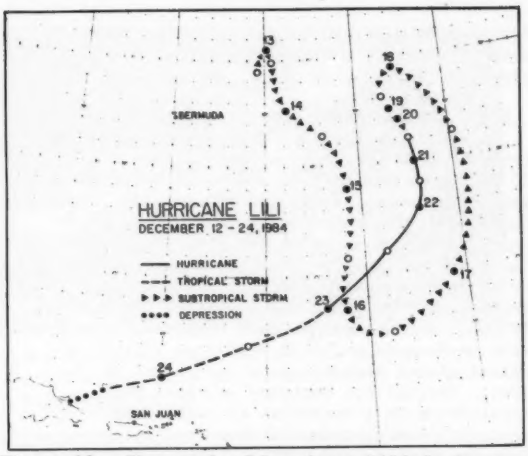

Figure 10.--The track of hurricane Lili during transition from subtropical to a tropical storm December 12-24, 1984.

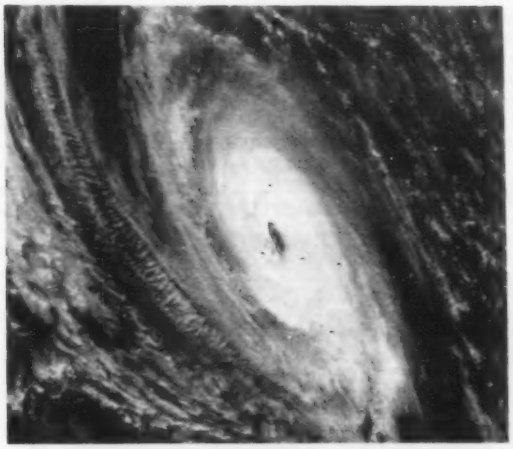

Figure 11.--Hurricane Lili near 25°N, 55°W at 1631 December 22, close to maximum strength. NOAA

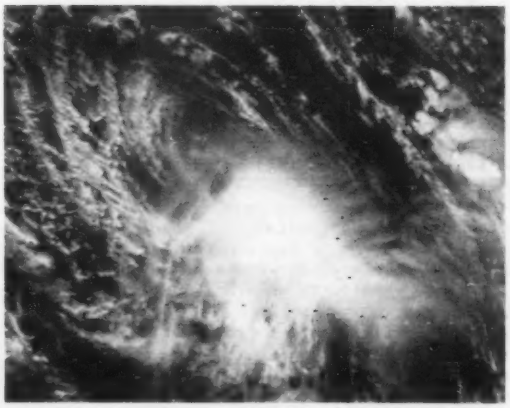

Figure 12.-- Tropical storm Lili approaching the Dominican Republic at 1631 Decmber 23. NOAA

The combination of a large upper-level low pressure system and a nearly stationary frontal zone resulted in the creation of a weak circulation northeast of Bermuda on 11 December. It was carried in the high seas broadcast as a developing gale center starting on 12 December. The subtropical-type storm moved south-southeastward for the next several days before recurving and accelerating northward on 17 December. It again turned toward the south on the 18th and gradually assumed tropical characteristics. The system was classified as hurricane Lili on 20 December. Lili moved on a south to southwest course with an increasing forward speed for the next few days and then the storm rapidly lost strength. The remnants of Lili moved into northeastern Dominican Republic on 24 December. Figures 11 and 12 show the rapid loss in organization of Lili in a 24-hour period.

During the period 15-23 December, more than 30 ships encountered gale force winds. When an eye-type feature began showing on satellite pictures on 20 December, the presence of a hurricane was confirmed by the ship SCANDIA TEAM (GUEP). At 1200, she reported 63-kn winds and a pressure of 982 mb, while located just south of the eye of the hurricane.

Mariners Weather Log

HURRICANE HUNTERS FLY THROUGH STORM

By T.R. Reid
Washington Post Staff Writer

Reprinted with permission from the September 13, 1984 issue of The Washington Post.

INSIDE HURRICANE DIANA, Sept. 12--Hurricane hunting can indeed be splendid.

Diana is a 50,000 ft.-high cylindrical stack of clouds, rain and ice swirling around a calm, quiet spot at the center.

It takes about 30 min. to fly through one side of the stack, across the eye and out the other side. In that half-hour, the hurricane hunters flying this P3 Orion turboprop experience an instantaneous passage from hell to paradise (fig. 13).

The storm itself is one vast expanse of menacing, charcoal-gray cloud. Lightning laces the sky in every direction. A wall of rain smashes the fuselage and streaks in minute needles along the plexiglass windows. A passenger sits with air-sick bag at the ready through the swooping ordeal.

Suddenly, without warning, we are cruising smoothly in the storm's placid inner circle, its eye.

Figure 14.-- One of the P3 Orion aircraft that routinely flies through hurricanes gathering data.

Bright sun gleams in a soft blue sky above, and far below the green sea appears through the parted clouds. In dawn's early light, an upside-down rainbow spreads over the rolling waves.

Pilot Brad Meyers curses softly as his windshield is covered with small black spots.

"Bugs," he explains. "They all converge in the eye, and you hit them by the thousands as you fly through."

And then, after the two min. it takes to cross the 10-mile-wide eye, we are plunged back into fire and brimstone.

The crew of the tossing, twisting P3 flying right through the swirling tropical fury of Hurricane Diana 5,000 feet above the roiling Atlantic is shaken and battered.

"Oh, man, this is a SCARY mother," Sam Calvert, the radio man on this National Oceanic and Atmospheric Administration crew, moans after the plane shimmers through a nauseating series of jolts and gyrations.

"I've been flying hurricanes for 19 years," he says, "and I still don't know why anybody'd do this job."

It is, however, a life-and-death job when a storm of Diana's size and intensity is wobbling uncertainly a few miles off the populated coast of the Carolinas.

The hundreds of thousands of people who might suddenly find themselves in the hurricane's path are dependent on forecasters at the National Hurricane Center in Miami to predict Diana's movements (fig. 14).

Those forecasters, in turn, are nearly helpless without the continuous stream of "high-density data" radioed back from the hurricane hunters in the heart of the storm.

Since Air Force planes and weather satellites first warned Saturday, (September 8) that Diana was veering toward shore, NOAA's two hurricane-hunting plans, with giant radar disks hanging from the belly and weather probes

Figure 14.-- Residents of Long Beach, NC head for home under downed utility poles on the 14 th. Wide World Photo.

bristling along wings, have flown continuous missions to gather up-to-the-minute information on the hurricane's size, power and direction.

The 10-hr., 2,300-mi. flight that left hot, muggy Miami at midnight tonight carried an eight-man crew to a rendezvous with the whirlwind just off the tip of Cape Fear, N.C.

There also were three research metereologists aboard who are fascinated with Diana because it is a rare "double-eye" hurricane. On a radar screen, the storm looks something like a bulls-eye, with not one but two clear circles at the center ringed by concentric black banks of cloud and rain.

The three researchers are less concerned with Diana in particular than in what she can reveal about some general problems of hurricane science, such as why the storms swirl counterclockwise north of the Equator but clockwise below it.

According to several members of the crew, bouncing through the tempests of Diana is as fulfilling for a student of weather as a trek up Mount Everest would be for a veteran mountaineer.

"Ooooh, I don't like this turbulence," says a white-faced Bob Black, a cloud physicist at the government's weather research center on Virginia Key, Fla.

"But the fact is, if you want to study storm clouds, you have to go up in a storm. If your field is weather, then you go where the weather is."

Not everyone on tonight's flight is frightened.

"Scared? Why would I be scared? This is a great aircraft," says Meyers, the rakishly handsome young pilot, chomping casually on a sandwich as the P3 slams perilously over a roller-coaster downdraft.

In fact, Meyers said his big fear is that the crew will remember that this is the first hurricane he has ever flown, meaning that he is obliged to buy beer for one and all back in Miami.

Frightened or fearless, the hurricane hunters work expertly through the long flight in a macho, wise-cracking manner. The 11 men chasing Diana tonight clearly feel the camaraderie generated by shared risk and splendor.

While the pilot and navigator plot their way through the storm, the rest of the crew is intensely tracking pressure readings, moisture content, wind speed and direction, and temperature variations on radar screens and computers mounted in the plane.

The aircraft looks like a flying warehouse for Radio Shack. Everywhere you turn, lights blink, dials glow, beepers beep, radios squawk.

Spinning reels of tape record the data for detailed study back in Miami. A huge line printer clanks out updates of 20 different variables every 10 sec for the length of the trip.

The computers are mounted on shock abosrbers and lashed carefully to the bulkhead with nylon webbing. Human accoutrements in the plane, in contrast, are spartan.

The crewmen sit in hard, straightbacked seats that are mounted on tracks so that a technician can slide from one instrument to the next without loosening his seat belt at rocky moments.

Bright orange life rafts are stowed in corners on the deck. An axe is mounted on the wall.

The fuselage is lined with safety warnings, but the crew members have adorned it as well with memoirs of their weather-shooting adventures.

By the door of the plane are the symbols of 19 hurricanes through which this P3 has flown. In the galley are stickers recalling a hurricane-hunting excursion with the Royal Australian Air Force and the "International Summer Monsoon Experiment, 1979."

All of which bespeaks the genuine pride the hurricane hunters take in their risky but essential daily duties.

While the crewmen are proud of the work they do, they feel, like many other federal workers, that their efforts may not be adequately appreciated.

"That...Reagan says federal bureaucrats don't earn their pay," laughs Dick Darby, the flight director of tonight's expedition.

"Well, who does he think is up here at 4 in the morning bouncing around like a cork in this lousy hurricane?"

Mariners Weather Log

A DATA REFERENCE SERVICE FOR COASTAL RESEARCHERS

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Introduction

Coastal Researchers often have difficulty obtaining the necessary data for conducting their research. Direct acquisition of data from field work is time consuming and expensive. When completed, it often becomes filed away in archives, inaccessible to other researchers who lack knowledge of its existence. Thus, data collection is sometimes duplicated, wasting funds that could be used for other efforts.

The U.S. Navy holds and manages a coastal information referral system that can alleviate some of these problems. Originally developed at the University of Virginia under the name, University of Virginia Information System (UVAIS), this referral system can provide researchers with sources of data and other information on the physical attributes of coastal zones around the world. This paper outlines the development of this referral system, describes its purposes and functions, and gives information on researcher access and input to the system.

UVAIS Development

The information referral system was developed at the University of Virginia to provide a quick reference for data on, and information about, coastal areas. The Navy commissioned its development because storage, retrieval, and delivery problems in the past had hindered much of the data which was collected from being fully utilized. Additionally, the Navy had no provision for the centralized control and storage of such data. Users of coastal data relied largely on personally developed data banks, constructed for their own localized, specific needs.

UVAIS was constructed as a unified, standardized means for cataloging the existence of coastal data. There are several benefits to this approach. A centralized system encourages the standardization of data collecting and reporting. It increases the frequency of data exchange among researchers. Reluctance to use unfamiliar data sets can be overcome, and comparisons between different data sets become more feasible. Gaps in data coverage can also be immediately identified.

The Navy has a particular interest in the study of coastal zones because an understanding of process behavior in these areas is essential to Naval operations. A means of locating relevant data sets is, therefore, essential. UVAIS was originally implemented as part of the Ship Analysis and Retrieval Program (SHARP), a data base management system housed at the Naval Ship Research and Development Center (NSRDC) in Carderock, Maryland. All original design and testing took place under the aegis of that system.

CERS: Coastal Environmental Reference Service

In 1980, it became apparent that the information system had outgrown the available working space in the SHARP system. Over 5000 records were listed (table 5), and a new query mode was being planned. Existing query modes included a general tutorial access and a shorter, advanced form of access. A third query mode, the analog component, had been designed and was ready or implementation. In order to accommodate he increased size of the system and make it more readily accessible, it was transferred to the Naval Oceanographic Office in Bay St. Louis, Mississippi. The UNIVAC computer facilities at Bay St. Louis are much larger than those available in Carderock, and could easily assimilate the coastal information system. NAVOCEANO had also developed an Oceanographic Management Information System (OMIS) which is housed at Bay St. Louis. The OMIS is an automated System developed expressly to collectively monitor and make available information on various programs, requirements, assets, technology, and data pertaining to oceanography, meteorology, mapping, charting, and geodesy. The coastal information system, renamed the Coastal Environmental Reference Service (CERS), became a part of the parent OMIS structure. Access to it is available to any serious researcher in coastal processes.

Table 5.-- Inventory of CERS type 2 records*

	GMX	NAT	SAT	NPC	SPC	MED	CAR	NTH	ARC	GCA	BLT	PRS	TOTAL
Waves	58	335	1	144		1	4	135	8	1	1	1	685
Tides	59	143	3	197	4		2	68	2	1	1		390
Currents	20	40	3	118			3	45	3		8	1	249
Winds	187	360	2	504		12	2	113	30		11		1224
Bathymetry	42	138	2	12			2	16	1		1	1	215
Sediments	37	146	2	95			2	95		1	5	1	395
Beach Morph.	44	186	2	109			1	54	3		1	1	443
T.D.S.*	26	81	1	94			3	37	5		24		271
Meteorological Parameters	183	369	1	443		12	2	83	32		10		1137
TOTAL	650	1927	18	1646	4	35	21	541	83	3	58	5	5000

*Temperature, density, and salinity
*Current through 3/81

GMX = Gulf of Mexico; NAT = North Atlantic; SAT = South Atlantic; NPC = North Pacific; SPC = South Pacific; MED = Mediterranean; CAR = Caribbean Sea; NTH = North Sea; ARC = Arctic Ocean; GCA = Gulf of California; BLT = Baltic; PRS = Persian Gulf.

Use of the System

The CERS system design has a very specific focus: to give information about the design and

```
PLEASE ENTER QUERY MODE OPTION.
ENTER  AD FOR ADVANCED, TU FOR TUTORIAL, AN FOR ANALOG.
>TU
YOU HAVE SELECTED THE TUTORIAL QUERY MODE.
YOU MAY QUERY ON A SEARCH PARAMETER
FROM A SPECIFIED LIST. IF AT ANY TIME YOU
REQUIRE ASSISTANCE OR MORE EXPLANATION WHILE
ENTERING YOUR QUERY, TYPE IN THE WORD HELP.
IF YOU DISCOVER THAT ONE OF THE VALUES WHICH
YOU TYPED IS INCORRECT, JUST CONTINUE YOUR
QUERY. AFTER YOUR QUERY HAS BEEN ENTERED
YOU WILL BE OFFERED AN OPPORTUNITY TO RETURN
TO THE START AND CORRECT YOUR QUERY.
```

Figure 15.--Introductory explanation for the CERS tutorial mode.

```
PARAMETER OF CONCERN OPTIONS (CHOOSE 1):

CODE  PARAMETER          CODE  PARAMETER          CODE  PARAMETER
01  WAVES               02  TIDES               03  CURRENTS
04  WIND                11  WATER TEMPERATURE   12  SALINITY
13  WATER DENSITY       20  STORMS              21  AIR TEMPERATURE
22  BAROMETRIC PRESSURE 23  PRECIPITATION       24  DEW POINT
25  VISIBILITY          26  SOLAR RADIATION     27  TEMP. OF SUBSTRATE
30  BATHYMETRY          31  SEDIMENTS           32  BEACH MORPHOLOGY
33  BCH CHARACTERISTICS
ENTER APPROPRIATE CODE.
>32
COUNTRY OF INTEREST (CHOOSE 1):

CODE   COUNTRY                    CODE   COUNTRY

 AG   ALGERIA                     AS   AMERICAN SAMOA
 AY   ANTARCTICA                  AS   AUSTRALIA
 BF   BAHAMAS                     BB   BARBADOS
 BE   BELGIUM                     BD   BERMUDA
 BR   BRAZIL                      VI   BRITISH VIRGIN IS
 CA   CANADA                      EG   CANTON ISLAND
 CJ   CAYMAN ISLANDS              CH   CHINA
 KT   CHRISTMAS ISLAND            CU   CUBA
 DA   DENMARK                     GC   E. GERMANY
 FI   FINLAND                     FR   FRANCE
 GB   GABON                       UK   GREAT BRITAIN
 GJ   GRENADA                     GP   GUADELOUPE
 GQ   GUAM ISLAND                 GY   GUYANA
 IR   IRAN                        JA   JAPAN
 JQ   JOHNSTON ATOLL              KU   KUWAIT
 LY   LIBYA                       MY   MALAYSIA
 MB   MARTINIQUE                  MX   MEXICO
 MQ   MIDWAY ISLAND               NL   NETHERLANDS
 NU   NICARAGUA                   NO   NORWAY
 PK   PAKISTAN                    PP   PAPUA/NEW GUINEA
 PL   POLAND                      RQ   PUERTO RICO
 SG   SENEGAL                     SF   SOUTH AFRICA
 UR   SOVIET UNION                SP   SPAIN
 ST   ST. LUCIA                   VC   ST. VINCENT
 NS   SURINAM                     TW   TAIWAN
 TH   THAILAND                    TD   TRINIDAD AND TOBAGO
 TC   UNITED ARAB EMIRATES        US   UNITED STATES
 IQ   US MISC PACIFIC IS          VQ   VIRGIN ISLANDS (U.S.)
 WQ   WAKE ISLAND                 GE   W. GERMANY
 YD   YUGOSLAVIA
ENTER APPROPRIATE CODE.
>US
```

Figure 16a.--Sample tutorial query: environmental parameters and geographic areas for searches.

Figure 16b.--Sample tutorial query: oceanic areas for searches, latitude and longitude entries, and conclusion of query.

availability of data sets. No "hard," or actual, data has been included. Through the use of remote terminals, a user may access the system and design a query suited to his particular needs, facilitated by a computer prompt/response program (fig. 15). Three tutorial modes of access are available: a general tutorial form, an advanced query form, and an analog component. The general tutorial form provides easy access for the novice user by exsisting him in collecting information in a step-by-step manner. The only specific information which the user must know in advance is the latitude and longitude of the area of interest. The system will guide him through the remainder of the query by prompting for specific answers to displayed questions. Information sections are available at each stage of the query, as are HELP sections with more detailed explanations (figs. 16a and 16b). Searches are broken down to 59 geographic areas and 17 oceanic areas. The output format is streamlined to assist the researcher in his analysis (fig. 17).

```
                    GENERAL INFORMATION ON DATA COLLECTION PROGRAMS

REPORT  TP1                                                  AUG 11 1981

RCDID       0041
NEW JERSEY COASTAL INLET AND BEACH STUDY

STUDY-TYPE  SITE SPECIFIC       DATA-TYPE   REAL            SITES   1
PARAMETERS  BEACH MORPHOLOGY
            SEDIMENTS
            BATHYMETRY
MEDIUMS     MAPS/CHARTS
            MICROFILM
DATA-AVAL   COST OF RETRIEVAL/REPRODUCTION
SPONSOR     U.S. ARMY CORPS OF ENGINEERS
POC-NAME    H.R. SPIES, CHIEF, SURVEY BRANCH, OPERATIONS DIVISION
POC-INST    U.S.  ARMY ENGINEERS DISTRICT, PHILADELPHIA
POC-ADD     U.S. CUSTOMS HOUSE 2ND AND CHESTNUT ST.
POC-STATE   PHILADELPHIA, PA. 19106
POC-PHONE   215-597-4745

REMARKS     ANALYSES DONE IN TERMS OF FEASIBILITY STUDIES AND GENERAL
            DESIGN STUDIES ONLY.  MEASUREMENTS ACCURRATE TO WITHIN
            .2FT., ALTHOUGH 62-65 DATA IS THE MORE ACCURATE DUE TO
            BETTER INSTRUMENTATION. DEPTH RECORDING WAS DONE WITH A
            MODEL E8130 BLUDWORTH RECORDER WORKING AT 200KHZ. WITH
            PROVISION FOR SPEED OF SOUND IN WATER. THE INSTRUMENT WAS
            RECALIBRATED TWICE A DAY AND IS ACCURATE TO .25 TO .5
            PERCENT. GRAIN SAMPLES WERE TAKEN AT BERM, LOW WATER LINE,
            AND ONE BETWEEN THOSE TWO, AND AT -12 AND -20 FEET.


WOULD YOU LIKE TO SUBMIT ANOTHER QUERY (Y OR N)?
>N
RETRIEVAL TERMINATED
>$FIN
```

Figure 17.--CERS Type 1 record.

```
PLEASE ENTER QUERY MODE OPTION.
ENTER  AD FOR ADVANCED, TU FOR TUTORIAL, AN FOR ANALOG.
>AD
PLEASE INPUT QUERY COMMANDS
>IF RCDID = 0007-041
>REPORT TP2
>$END
YOUR QUERY HAS BEEN ACCEPTED.
```

Figure 18.--Sample advanced query.

The advanced query mode presupposes a familiarity with the system and is designed to expedite queries for frequent users of CERS by skipping many of the system-prompt statements. This saves time and reduces the cost of accessing the system (fig. 18). The user merely enters a formatted string of information which establishes the search criteria desired, and presentation of the search results immediately.

The straightforward language used in the system and logical progression of questions permit the user to design a query which will give him specific and detailed records with little extraneous information. An option is available, however, which allows the user to receive additional information for a parameter of interest if he so desires. This gives further information about methods, publications, and references. Information sections can be obtained for 19 parameters (fig. 16a).

The Analog Component

Information is often required about areas of the world which have not been extensively studied or whose data sets are inaccessible because of political or logistical considerations. In such cases, an information system query will locate neither sufficient data files nor an appropriate geophysical model. Records for adjacent areas may be retrieved by enlarging the area of search (latitude/longitude parameters). This risks receiving extraneous and/or erroneous information, however. A difference of 10° latitude, between North Carolina (35°N) and the Florida Keys (25°N), for example, results in information for coastlines which are very dissimilar.

The analog, or data transfer, mode seeks to alleviate this problem. This mode of query is predicated on the hypothesis that coastal processes will act in a similar fashion along coasts which are physically similar. In other words, one might expect a storm of a given duration and intensity to effect the same types of damage or changes along two separate reaches of coast which share similar physical attributes such as beach slope, orientation, bathymetric profile, sediment size, and geology.

In order to make the analog mode a functional component of the system, certain hard data must be included. These data are those pieces of information which characterize a coastal site. The diagnostic parameters are used as the basis of a search and match query; however, they are not included in the record output for a site. The parameters designated "diagnostic" must satisfy two criteria: 1) they must be site-specific features, not regional trends, and 2) the information must be readily accessible in common-knowledge sources such as atlases, charts, maps, or published reports.

At present, 16 parameters are being used to characterize each site already in the system. These data have been appended to every record previously attached to the system and are routinely included in every new record as it is entered. Values for each parameter are routinely available from non-classified sources for most coastal reaches worldwide. It is not necessary to enter a value for every parameter in order to make a successful analog run. However, the user should keep in mind that as more information is made available to the computer, a more reliable match can be achieved. The parameters now in the system are:

01 Coastal Landform Type - Regional Geology
02 Coastal Landform Type - Relief
03 Coastal Landform Type - Shoreline Character
04 Waves - Significant Breaker Height
05 Waves - Wave Climate Class
06 Tidal Range
07 Tidal Type
08 Storm Frequency
09 Beach Materials - Particle Size
10 Beach Materials - Particle Type
11 Bottom Materials - Particle Size
12 Bottom Materials - Particle Type
13 Coastal Orientation
14 Offshore Configuration
15 Wind Speed
16 Wind Direction

The analog program will search the record files for those sites with matching values for the parameters entered. It will print a list of those record identification numbers which have matching features and the number of parameters which did correlate. The user is then directed to access the system in the normal modes to see specific records. Like the tutorial and advanced query modes, the analog mode delivers no hard data. The analog system will not predict processes, nor is there a guarantee that the data, once acquired from the listed source for a particular area, will be directly applicable to the user's needs. The system will, however, provide an estimate of what one might expect to find in the data-poor area. The user is provided with a list of contacts, so he acquires knowledge of persons doing similar work in an environment similar to his. These sources may, in turn, lead the user to pertinent information in areas closer to his own. Additionally, the user will know what type of work has or has not been effective in similar coastal environments.

System Access: The Analog Component

The analog component has been designed with more complexity than the other parts of the system. More input is required from the user, and more information must be available before a

```
ENTER  AD FOR ADVANCED, TU FOR TUTORIAL, AN FOR ANALOG.
>AN
WOULD YOU LIKE AN EXPLANATION OF THE ANALOG SEARCH (Y OR N)?
>Y
          THERE WILL BE OCCASIONS WHEN A USER'S QUERY ON CERS
        FOR INFORMATION ON A SPECIFIC COASTAL AREA WILL PRODUCE
        NO RESULTS. THIS ANALOG QUERY MODE PERMITS RETRIEVAL
        OF RECORDS IN THE DATA BASE PHYSICALLY SIMILAR TO THE
        AREA IN QUESTION. THIS ALREADY STUDIED AREA CAN THEN
        SERVE AS AN ANALOG TO THE AREA IN QUESTION.
            WHEN THE ANALOG MODE IS SELECTED, THE USER IS
        PROMPTED TO PROVIDE THE PHYSICAL PARAMETERS WHICH
        DESCRIBE THE COASTAL ENVIRONMENT OF HIS AREA OF
        INTEREST. THE SYSTEM WILL SEARCH UP TO SIXTEEN
        DESCRIPTIVE PARAMETERS AND A QUERY MAY BE BASED
        ON AS MANY OF THESE PARAMETERS AS CAN BE ACCURATELY
        DEFINED. THE MORE THAT ARE USED, OF COURSE, THE
        BETTER WILL BE THE MATCH BETWEEN ENVIRONMENTS. IF
        LESS THAN EIGHT PARAMETERS CAN BE ADEQUATELY DEFINED,
        THIS SEARCH IS NOT RECOMMENDED. IF NO DATA BASE
        RECORDS ARE RETRIEVED BASED ON THE SET OF PARAMETERS
        CHOSEN THE USER WILL BE GIVEN THE OPTION TO SUBMIT
        ANOTHER QUERY BASED ON A DIFFERENT SET.
            OUTPUT FROM THE ANALOG QUERY WILL RECOGNIZE THOSE
        RECORDS WHICH MATCH TWO-THIRDS OR MORE OF THE PARAMETERS
        SELECTED AND IDENTIFIED. RECORD NUMBER AND THE RATIO OF
        PARAMETERS MATCHED WILL BE PRINTED OUT. FOLLOWING THIS OUTPUT
        LIST DIRECTION IS GIVEN ON HOW TO ACCESS THOSE RECORDS OF
        COASTAL AREAS WHICH ARE IDENTICAL AS ANALOGS TO THE USER'S
        AREA OF INTEREST.
            IF AT ANY TIME YOU REQUIRE ASSISTANCE OR MORE
        EXPLANATION WHILE ENTERING YOUR QUERY, TYPE IN THE WORD
        HELP OR H.
            THE PARAMETERS THAT CAN BE USED IN YOUR QUERY ARE
        LISTED BELOW. THE FIRST THREE ARE CONSIDERED ESSENTIAL
        TO CHARACTERIZING A COASTAL AREA AND THEREFORE  ARE REQUIRED
        FOR ANY ANALOG SEARCH.
            01 COASTAL LANDFORM TYPE - REGIONAL GEOLOGY
            02 COASTAL LANDFORM TYPE - RELIEF
            03 COASTAL LANDFORM TYPE - SHORELINE CHARACTER
            04 WAVES - SIGNIFICANT BREAKER HEIGHT
            05 WAVES - WAVE CLIMATE CLASS
            06 TIDAL RANGE
            07 TIDAL TYPE
            08 STORM FREQUENCY
            09 BEACH MATERIALS - PARTICLE SIZE
            10 BEACH MATERIALS - PARTICLE TYPE
            11 BOTTOM MATERIALS - PARTICLE SIZE
            12 BOTTOM MATERIALS - PARTICLE TYPE
            13 COASTAL ORIENTATION
            14 OFFSHORE CONFIGURATION
            15 WIND SPEED
            16 WIND DIRECTION
        ENTER CODE NUMBERS OF DESIRED PARAMETERS SEPERATED
        AND TERMINATED BY COMMAS. IF ALL ARE BEING USED
        KEY IN THE WORD ALL.
>01,02,03,04,05,06,07,09,10,11,13,14,15,16,
YOU HAVE CHOSEN 14 PARAMETERS.
RECORDS WILL BE IDENTIFIED  WHICH HAVE
MORE THAN OR COMPATIBLE PARAMETERS.
```

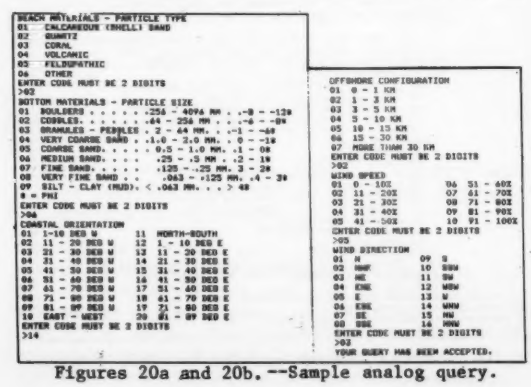
Figure 19.--Explanatory section for CERS analog component.

query is initiated. Therefore, this component is available only in the tutorial mode.

The computer begins the interaction by ascertaining if the user is already familiar with the system. If he has not used the system before, he may wish to have an explanatory section printed (fig. 19). This section lists the parameters used to determine the analog and describes how the program makes the search. The user is cautioned that we do not recommend the analog search if information is available for fewer than 8 of the 16 parameters. The reliability of the analog increases with the amount of data which the user can supply for his area of interest. If, at any time during the query, the user is unsure of how to proceed or questions the method used to calculate a value for a particular parameter, he may type "HELP" for additional explanations. To continue with a query, one must enter the indicated codes of those parameters for which information exists (fig. 19).

In the example here, we chose a site at random on the southeast coast of Africa (Port Durnford, Zululand). This region was selected because it is an area of political uncertainty and a constant, reliable flow of data from the region could not be anticipated. A query to the system indicated that no data collection program was in effect that could be accessed. A computer literature search showed a published article describing the area in general, we were able to define 14 of the 16 parameters from

NOW: INDICATE THE DESIRED PARAMETER VALUES BELOW:
COASTAL LANDFORM TYPE - GEOLOGY
01 OLDER RESISTANT
02 LOW RESISTANT
03 RECENT VOLCANICS
04 RECENT FLUVIAL AND DELTAIC
05 GLACIAL AND GLACIAL-FLUVIAL
ENTER CODE MUST BE 2 DIGITS
>03
COASTAL LANDFORM TYPE - RELIEF
01 HIGH RELIEF
02 HIGH RELIEF - CLIFFED
03 LOW RELIEF
04 LOW RELIEF - CLIFFED
05 COASTAL PLAIN
06 COASTAL PLAIN - CLIFFED
ENTER CODE MUST BE 2 DIGITS
>05
COASTAL LANDFORM TYPE - SHORELINE CHARACTER
01 SAND BEACH OR BARRIER ISLAND
02 SAND BEACH - ROCK HEADLAND
03 PICKET BEACH
04 MUDFLAT OR MARSH
05 SWAMP OR MANGROVE
06 CORAL
07 ROCK
08 TIDAL FLAT
ENTER CODE MUST BE 2 DIGITS
>01
WAVES - SIGNIFICANT WAVE HEIGHT
01 0 - 1.5 FT
02 1.5 - 3 FT
03 3 - 4.5 FT
04 4.5 - 6 FT
05 6 - 8 FT
06 GREATER THAN 8 FT
ENTER CODE MUST BE 2 DIGITS
>03
WAVES - WAVE CLIMATE CLASS
01 VERY LOW! LESS THAN 20% GREATER THAN 5 FT
02 LOW! 20% - 30% GREATER THAN 5 FT
03 MODERATE! 30% - 40% GREATER THAN 5 FT
04 HIGH! 40% - 50% GREATER THAN 5 FT
05 VERY HIGH! MORE THAN 50% GREATER THAN 5 FT
ENTER CODE MUST BE 2 DIGITS
>04
TIDAL RANGE
01 LESS THAN 1 FT 05 5 - 6 FT
02 1 - 2 FT 06 6 - 8 FT
03 2 - 3 FT 07 8 - 10 FT
04 3 - 5 FT 08 MORE THAN 10 FT
ENTER CODE MUST BE 2 DIGITS
>05
THANKLE TRY AGAIN
ENTER CODE MUST BE 2 DIGITS
>05
TIDAL TYPE
01 DIURNAL
02 SEMI-DIURNAL
03 MIXED
ENTER CODE MUST BE 2 DIGITS
>02
BEACH MATERIALS - PARTICLE SIZE
01 MORE THAN 4 MM. . . PEBBLES . . . . . (< -2.08)
02 2 - 4 MM. . . . . GRANULES. . . . . (< -1 TO -2)
03 1 - 2 MM. . . . . VERY COARSE SAND. (0 TO -1)
04 0.5 - 1.0 MM. . . . COARSE SAND . . . (1 TO 0)
05 0.25 - 0.5 MM . . . MEDIUM SAND . . . (2 TO 1)
06 .125 - .25 MM . . . FINE SAND . . . . (3 TO 2)
07 .063 - .125 MM. . . VERY FINE SAND. . (4 TO 3)
08 LESS THAN .063 MM . SILT - CLAY . . . (> 4 0)
0 = PHI
ENTER CODE MUST BE 2 DIGITS
>05


BEACH MATERIALS - PARTICLE TYPE
01 CALCAREOUS (SHELL) SAND
02 QUARTZ
03 CORAL
04 VOLCANIC
05 FELDSPATHIC
06 OTHER
ENTER CODE MUST BE 2 DIGITS
>03
BOTTOM MATERIALS - PARTICLE SIZE
01 BOULDERS . . . . . .256 - 4096 MM . . -8 - -12
02 COBBLES. . . . . .64 - 256 MM . . . -6 - -8
03 GRANULES - PEBBLES . 2 - 64 MM. . . -1 - -6
04 VERY COARSE SAND . 1.0 - 2.0 MM. . 0 - -1
05 COARSE SAND. . . . . 0.5 - 1.0 MM. .1 - 0
06 MEDIUM SAND. . . . . .25 - .5 MM . .2 - 1
07 FINE SAND. . . . . .125 - .25 MM. 3 - 2
08 VERY FINE SAND . . . .063 - .125 MM. .4 - 3
09 SILT - CLAY (MUD). < .063 MM. . . > 4
0 = PHI
ENTER CODE MUST BE 2 DIGITS
>06
COASTAL ORIENTATION
01 1-10 DEG W 11 NORTH-SOUTH
02 11 - 20 DEG W 12 1 - 10 DEG E
03 21 - 30 DEG W 13 11 - 20 DEG E
04 31 - 40 DEG W 14 21 - 30 DEG E
05 41 - 50 DEG W 15 31 - 40 DEG E
06 51 - 60 DEG W 16 41 - 50 DEG E
07 61 - 70 DEG W 17 51 - 60 DEG E
08 71 - 80 DEG W 18 61 - 70 DEG E
09 81 - 90 DEG W 19 71 - 80 DEG E
10 EAST - WEST 20 81 - 89 DEG E
ENTER CODE MUST BE 2 DIGITS
>14
OFFSHORE CONFIGURATION
01 0 - 1 KM
02 1 - 3 KM
03 3 - 5 KM
04 5 - 10 KM
05 10 - 15 KM
06 15 - 30 KM
07 MORE THAN 30 KM
ENTER CODE MUST BE 2 DIGITS
>02
WIND SPEED
01 0 - 10% 06 51 - 60%
02 11 - 20% 07 61 - 70%
03 21 - 30% 08 71 - 80%
04 31 - 40% 09 81 - 90%
05 41 - 50% 10 91 - 100%
ENTER CODE MUST BE 2 DIGITS
>05
WIND DIRECTION
01 N 09 S
02 NNE 10 SSW
03 NE 11 SW
04 ENE 12 WSW
05 E 13 W
06 ESE 14 WNW
07 SE 15 NW
08 SSE 16 NNW
ENTER CODE MUST BE 2 DIGITS
>03
YOUR QUERY HAS BEEN ACCEPTED.

Figures 20a and 20b.--Sample analog query.

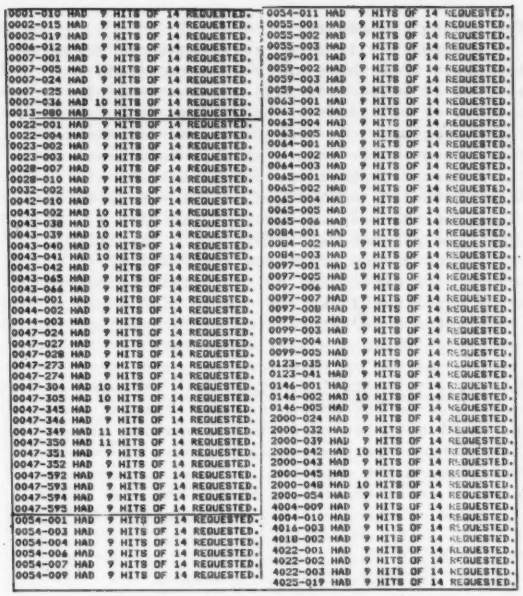


Figure 21.--Analog mode output.

this article. Figures 20a and 20b illustrate the query process as these 14 variables were

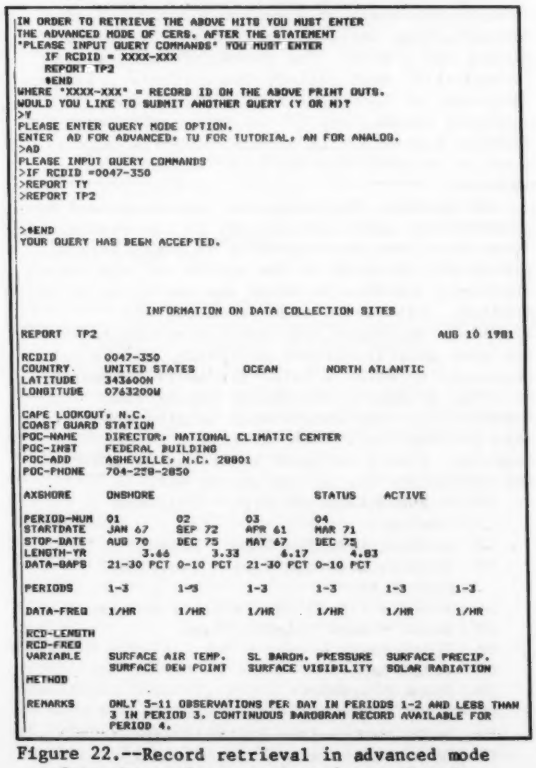

IN ORDER TO RETRIEVE THE ABOVE HITS YOU MUST ENTER
THE ADVANCED MODE OF CERS. AFTER THE STATEMENT
"PLEASE INPUT QUERY COMMANDS" YOU MUST ENTER
IF RCDID = XXXX-XXX
REPORT TP2
$END
WHERE "XXXX-XXX" = RECORD ID ON THE ABOVE PRINT OUTS.
WOULD YOU LIKE TO SUBMIT ANOTHER QUERY (Y OR N)?
>Y
PLEASE ENTER QUERY MODE OPTION.
ENTER AD FOR ADVANCED, TU FOR TUTORIAL, AN FOR ANALOG.
>AD
PLEASE INPUT QUERY COMMANDS
>IF RCDID =0047-350
>REPORT TY
>REPORT TP2
>$END
YOUR QUERY HAS BEEN ACCEPTED.
INFORMATION ON DATA COLLECTION SITES
REPORT TP2 AUG 10 1981
RCDID 0047-350
COUNTRY UNITED STATES OCEAN NORTH ATLANTIC
LATITUDE 343600N
LONGITUDE 0763200W
CAPE LOOKOUT, N.C.
COAST GUARD STATION
POC-NAME DIRECTOR, NATIONAL CLIMATIC CENTER
POC-INST FEDERAL BUILDING
POC-ADD ASHEVILLE, N.C. 28801
POC-PHONE 704-270-2850
AXSHORE ONSHORE STATUS ACTIVE
PERIOD-NUM 01 02 03 04
STARTDATE JAN 67 SEP 72 APR 61 MAR 71
STOP-DATE AUG 70 DEC 75 MAY 67 DEC 75
LENGTH-YR 3.66 3.33 6.17 4.83
DATA-GAPS 21-30 PCT 0-10 PCT 21-30 PCT 0-10 PCT
PERIODS 1-3 1-3 1-3 1-3 1-3 1-3
DATA-FREQ 1/HR 1/HR 1/HR 1/HR 1/HR 1/HR
RCD-LENGTH
RCD-FREQ
VARIABLE SURFACE AIR TEMP. SL BAROM. PRESSURE SURFACE PRECIP.
SURFACE DEW POINT SURFACE VISIBILITY SOLAR RADIATION
METHOD
REMARKS ONLY 5-11 OBSERVATIONS PER DAY IN PERIODS 1-2 AND LESS THAN 3 IN PERIOD 3. CONTINUOUS BAROGRAM RECORD AVAILABLE FOR PERIOD 4.

Figure 22.--Record retrieval in advanced mode after the analog component is completed.

entered. If no mistakes are made in the entry format, the computer will inform the user that his query has been accepted. After a short wait, those records which match at least two-thirds of the input variables are listed with the number of matching parameters (fig. 21).

The list of analog record identification numbers is followed by instructions for retrieving any records which the user wishes to see. By entering the system in the advanced mode, specific records can be requested (fig. 22). In this way, the user can select the level of correlation which he is willing to accept. Figure 22 shows the records for the highest level attained in this query (11 out of a possible 14 matches). These records indicate that out of the 5,000 records in the system representing locations in Europe, North America, South America, and Asia, the reach of coast most physically similar to the Zululand area is Cape Lookout, North Carolina. The Cape Lookout area has been studied extensively in terms of both physical characteristics and coastal processes, and those data sets will provide an estimate of the conditions in an area which is considerably less accessible.

Conclusions

The University of Virginia information system is available for researcher use on the NAVOCEANO computers in Bay St. Louis, Mississippi. At this facility, it has become part of the OMIS master program and renamed the Coastal Environmental Reference Service (CERS). Explanations have been written in the program so that the tutorial mode of query is clear even to users with no prior computer experience. The OMIS parent program is structured such that a query can be processed quickly, and little extraneous information is delivered. The Navy has further prepared a Retrieval Program Users Guide to further simplify understanding of the system for researchers.

The CERS concept is effective because it allows a continuing relationship between the data contributors and the data users. Updating and additions of new records are continual processes. If CERS suits the particular needs of a coastal data manager by making information available in an automated fashion, he will be encouraged to participate in the expansion of the data base as a regular contributor. Coastal scientists wishing to become part of the system should contact Dr. Robert Dolan, Department of Environmental Sciences, 101 Clark Hall, University of Virginia, Charlottesville, Virginia, 22903 (804-924-3809). Potential users of the system may also contact the Navy managers, Mr. Richard B. Blumenthal or Mr. Andrew D. Stone, NSTL Station, Naval Oceanographic Office, Bay St. Louis, Mississippi, 39522 (601-688-4498).

Marine Observations Program

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FREAK WAVES AND EXTREME STORM WAVES

Webster's New Collegiate Dictionary defines "freak" as, "a seemingly capricious action or event." A freak wave may be defined as a wave that is out of proportion to the other waves in a seaway. They usually appear suddenly, unexpectedly, and are not forecast. The term freak wave has been used as a label for any wave that does not fit the normal, even if conditions that cause the waves can be forecast. For instance, the Agulhas current flowing swiftly from the northeast causes steepening of the high swell from the southwest that opposes the current off the southeast coast of Africa. This situation produces the high-steep waves with deep troughs before them called "cape rollers" and is described by Schumann (1)(2). With a wave measuring buoy south of the Cape of Good Hope, the prospects for forecasting the occurrence of these freak waves seems possible. Waves in the Gulf Stream near Cape Hatteras have the same characteristics, but are usually smaller.

The Extreme Storm Waves (ESW) are a subset of the general category -- freak waves. The ESW appears to be about 2.5 times the significant wave (average of the highest 1/3) in the seaway according to Buckley (3). Wave height is measured from the trough ahead of the wave to the crest. The trough ahead of the ESW is deeper than normal, and is often referred to as a "hole in the sea." The period of the wave is not remarkably different from the other waves in the wave train, so the ESW has a very steep face compared to the other waves and is believed to move faster. Mariners who have experienced an ESW often describe the wave as a "wall of water." If you were surfing your vessel down the side of the trough toward an ESW, you would also understand the additional adjective, "overhanging," which is often used in describing an ESW. The crest is level and is often described as reaching from "horizon-to-horizon." This is probably the reason the ESW is sometimes reported as "mountainous swell."

This long level crest provides valuable clues as to the possible origin of the ESW and their long life. There are reports of ships detecting and following ESW for a "long" time on radar. However, no one has come forth with a time for the length of an ESW life cycle.

Normal waves are mounds of water that are raised by the transfer of energy from the wind to the sea surface. Even in large storms and hurricanes/typhoons, waves, though random, have general characteristics.

They have a longer dimension across the wind/wave direction than along it. They have

flattened crests with the highest part of the wave generally centered and the height falling off, both to the right and left of the wave center. The wave center or crest has the most potential energy and moves faster than the rest of the water in the wave and surges down the front of the wave in an arc spreading or dispersing forward, and to the right and left. They continue to form, surge forward and disappear. That is the normal, energy-dispersive wave.

The ESW is a different thing in many ways. They behave much like the energy-conserving swell which crosses oceans. With the level, "horizon-to-horizon" crest, water is moving at the same speed all along the wave. The crest cannot disperse energy to the right or to the left and the trough ahead of the ESW apparently provides a stabilizing or balancing effect which allows the ESW to persist for long periods. Most of the descriptions of ESW mention "foam along the crest" and "ready to break," but few, if any, mention actual cases of breaking.

The Captain of the U.S. Aircraft Carrier INDEPENDENCE (CV-62) describes his encounter with an ESW (3): "I looked out ahead, I'd estimate a mile to a mile and a half (it was raining), and I saw what appeared to me to be a significant wave coming. And, I mentioned to somebody that this thing was just like the Poseidon Adventure (a movie), and the thing rolled in and I watched it all the way in. And, it was right at the flight deck level where the rest of them had been 25 to 30, maybe a little over 30 ft. This baby was up around 55 to 60 ft. with a fairly good sized wave in front of it, unfortunately. When this (first) wave hit us, it lifted the nose up, she started to plow in and it (the bow) was coming down as this one (the 55-60 ft. wave) hit us. And, it just jarred the whole ship." The INDEPENDENCE was struck four times by ESW during that storm. Waves similar to the ESW shown in figure 23.

Hamilton (4) reports that ESW are even capable of capsizing the 12-meter diameter discus weather buoys. These buoys resemble a large poker chip with a mooring arrangement that keeps the buoys stable and upright during their encounters with millions of normal waves.

Figure 23.--An ESW approaches the U.S. aircraft carrier INDEPENDENCE, during a North Atlantic storm on 7-8 April 1977.

Attempts at forecasting the occurrence of ESW have not been successful by using either synoptic-scale weather maps or satellite images. Of course, with the normal wide dispersion of ship reports, the ESW could form and dissipate between two reporting ships. What we are looking for is a mesoscale feature in a data-sparse synoptic-scale network. Forecasting, using conventional methods, is largely non-productive. Fujita (5) introduced several network scales needed to study smaller meteorological events as shown in figure 24.

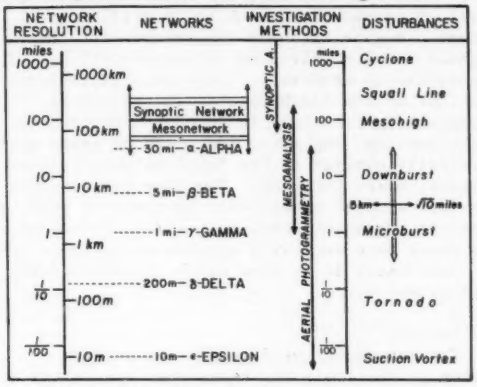


Figure 24.--Observation network scales.

There is also a gross mismatch in the time scales. The normal marine synoptic forecast map is analyzed every six hours. Marine forecasts are just not made for the rapid reaction needed for ESW forecasts. The ESW life span is probably measured in minutes, but we actually have no reports of how long an ESW persists or by what means it finally dissipates. From all indications we are looking for an event with a life cycle under one hour.

Any forecasting of ESW will therefore have to be done by the mates on the ships. However, Fujita's (5) work with downbursts in dense observing networks and with aircraft over land may provide clues to the mechanism for the formation of ESW at sea. A downburst is an aviation-type downdraft that reaches the surface and spreads out from the base of an active thundershower or thunderstorm as shown in figure 25a.

An illustration from Fujita (5) shows the damage path caused by multiple downbursts along the track of one severe thunderstorm. The damage footprint is 166-mi. long and about 17-mi. wide as shown in figure 25b. The F numbers refer to the amount of damage caused by the wind with damage increasing as the numbers increase.

It is suggested that similar situations occur at sea. If a thunderstorm of this type is imbedded in a storm that already has high wind and waves, it is suggested that this added energy might be the catalyst that organizes the storm waves into one or more ESW along the gust front.

Mr. Richard Tremblay, Chief Officer of the M/V SELKIRK SETTLER sent the following photographs which illustrate what an observer

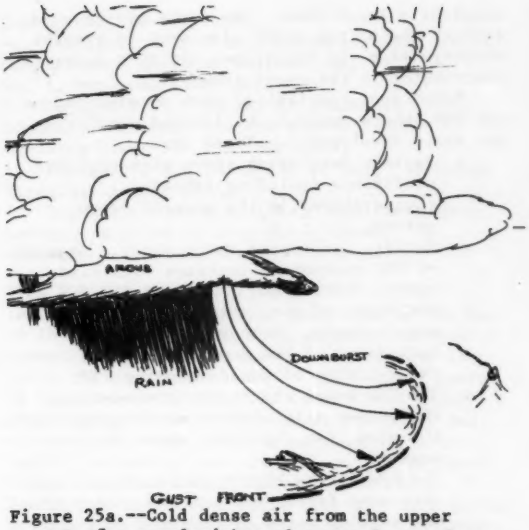


Figure 25a.--Cold dense air from the upper part of a cumulonimbus plummets downward as a downdraft in the air. It becomes a downburst when it strikes the surface and spreads out. The outer edge of the downburst is called a gust front or a shear line.

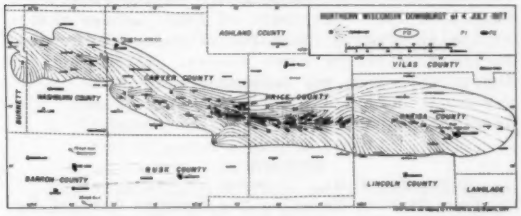


Figure 25b.-- Twenty-five downbursts on Independence Day in northern Wisconsin left behind a damage swath 166 mi long and 17 mi wide. No evidence of a tornado was found anywhere.

aboard ship would see when a downburst occurred.

Figure 26a.--is a distant view of the arcus cloud showing almost all of it. At the time, the M/V SELKIRK SETTLER was headed northwest and across Lake Superior for Thunder Bay, Ontario.

Figure 26b.--shows a closer view of the left (southern) side of the arcus cloud and view c is the right (northern) side of the arcus cloud.

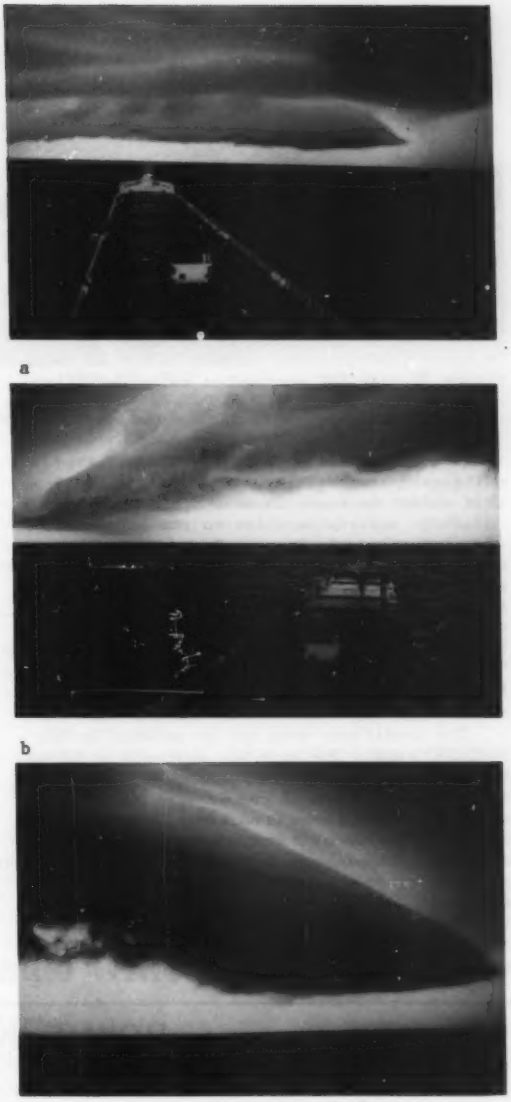


Figure 26.--Arcus (roll) cloud announces the development of a downburst.

The wind and waves were calm in the first view. When the cloud passed overhead the wind jumped to 84 kn and heavy rain commenced soon after.

In this instance, Mr. Tremblay was able to take some excellent weather photographs because the thunderstorm was isolated. Of course, no ESW developed because there were no high waves to start from, but wind damage to loose gear and to sailing craft in a downburst like this could have been severe.

From Stevenson's (6) account of the sinking of the British sailing barque MARQUES, they were apparently involved with a downburst similar to the one that struck the M/V SELKIRK SETTLER. Unfortunately, it was at night, in squally, rainy weather, and nothing was seen to warn them until the downburst struck.

After reading all of the accounts available and tryinq to guess the "heavily reefed" sail configuration, there are still questions from a meteorological standpoint as to what happened. According to the survivors accounts, when the wind struck from the port quarter, the "bow buried, rolling the MARQUES on beam ends after 10 seconds, started to go under after 30, and

Figure 27.--An ESW approaches an unidentified ship in the Bay of Biscay (Photo from Surveyor, May 1968, pg. 23).

sank after 45 sec." There is no mention of masts or spars breaking, or sails tearing from this sudden increase in wind speed (fig. 27).

There are similarities to the F/V FAIRWIND (3) sinking on the Georges Bank where the deepwater fishing vessel buried its bow into a wave and was flipped over by an ESW. The F/V FAIRWIND was in a rapidly developing storm with winds of about 80 kn and seas of 50 plus ft. The lone survivor of this accident said the ship "surfed" down a wave, buried the bow, and the following very steep "70 ft" ESW got under the stern and flipped the vessel end for end.

The conditions were not as extreme in the MARQUES' case. The wind was westerly at 35-40 kn and gusty. Seas were running 20 ft. If the downburst situation of the Great Lakes was superimposed on these conditions, and a sustained series of downburts can cause ESW as suggested, the reason for the bow being buried and staying down becomes more apparent. As the gust front of the downburst struck the MARQUES, isn't it also possible that a developing ESW also struck the MARQUES, burying its bow, raising the stern and broaching the ship, thus assuring a knock-down. The force of the wave against the bottom would also work to prevent recovery from the knock-down and be a major contributor to the rapid sinking.

Based upon the limited data accumulated on the ESW, there seems to be favored conditions for their development. These are:

- o Rapidly developing storm with unstable conditions including imbedded thunderstorms in the general storm system.
- o Rapidly increasing gusty winds. Chances of ESW encounters increase with wind speeds over 50 kn.
- o Downburst of wind overdrives wave system; particularly, the higher waves.
- o Gust front of the downburst moving near - the velocity of the developing ESW.
- o The ESW being the higher-dominant wave in the seaway will collect more energy from the wind than the other waves in the seaway.
- o The ESW as the higher dominant wave will also move faster and collect energy from the smaller waves as they are overtaken in the seaway, according to Lake and Yuen (7).

All merchant vessels have radar of various capabilities, most of which can be tuned to receive radar weather echoes. Fujita (5) describes the development of radar echoes that typically produce downbursts from single echoes to the dissipating comma echoes. These, at least, will help you determine where the downburst and/or ESW may come from, if one develops (fig. 27a).

REFERENCES

1. Schumann, E.H., "Changes in Energy of Surface Gravity Waves in the Agulhas Current," Deep-Sea Research, Vol. 3, 1976, pp 509-518.
2. Schumann, E.H., "High Waves in the Agulhas Current," Mariners Weather Log, Vol 20, No. 1, 1976, pp 1-3.
3. Buckley, William H., "A Study of Extreme Waves and Their Effects on Ship Structure" DWTNSR&DC, Bethesda, MD 20084, Ship Structure

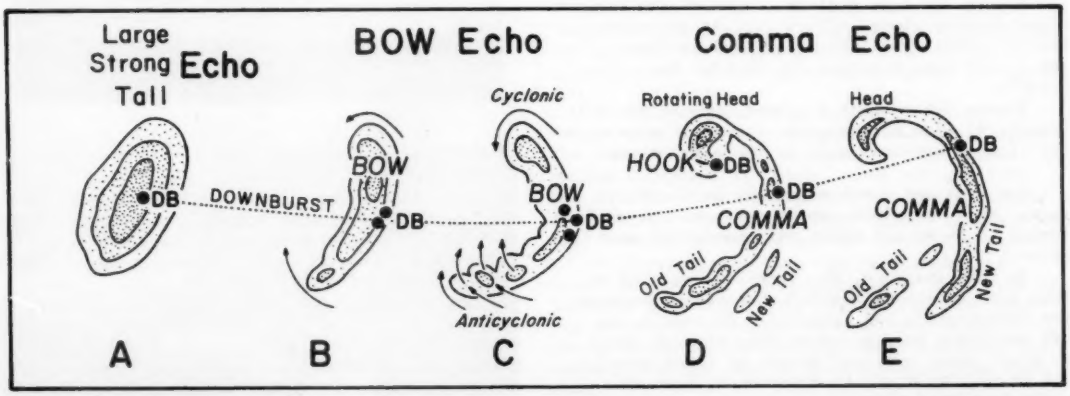


Figure 27a.--A typical morphology of radar echoes associated with strong and extensive downbursts. Some bow echoes disintegrate before turning into comma echoes. During the period of strongest downbursts, the echo often takes the shape of a spearhead or a kink pointing toward the direction of motion. (Fujita)

Committee, SSC-320, 1983.
4. Hamilton, G.D., "Buoy Capsizing Wave Conditions," Mariners Weather Log, Vol. 24, No. 3, May-June 1980, pp 165-173.
5. Fujita, T.T., "Manual of Downburst Identification for Project NIMROD," SMRP Research Paper No. 156, May 1978.
6. Stevenson, K., "Disaster at Sea," Yachting Magazine, August 1984.
7. Yuen, H.C. and B.M. Lake, "Nonlinear Wave Concepts Applied to Deep-Water Waves," in Solitons in Action, Academy Press, 1978.

TIPS FOR THE RADIO OFFICER

We are still receiving questions on the use of INMARSAT. INMARSAT is a secondary method of transmitting weather reports only because it costs the government money. The primary system is to transmit to the U.S. Coast Guard radio stations on CW or SITOR because the money has already been spent for the watchstanders for safety and navigation reasons, so the National Weather Service doesn't have to pay twice. Designated commercial radio stations back up the primary (USCG) and secondary systems (INMARSAT) which we also pay for, never the ship or the company.

Any ship (regardless of program) may send a weather report, without charges to the ship or its company, from our forecast areas, which are:

- o North of 25°S and east of 160°E in the Pacific;
- o North of the equator and west of 35°W in the Atlantic;
- o (INMARSAT only) south of 60°S to US coastal earth stations (CES)

The following procedures will help you speed the weather report on its way:

- o For U.S. commercial radio stations, use "OBS METEO WASHDC" for the address. After the call sign, use 10-character groups. Example: WXXX 0712499578 7142942498 7311010067 etc;
- o For non-U.S. radio stations use "OBS METEO_____" filling in the appropriate station;
- o For U.S. Coast Guard radio stations, no address is necessary. Just start the message and proceed with the call sign and numbers. The U.S. Coast Guard will also accept weather reports over single sideband voice radio in the ship code, just speak the call sign and the numbers;
- o For INMARSAT (in our forecast areas), select a U.S. CES, then send 41+ and the call back should appear as:

  41+

  NWS OBS MHTS

At this point you are in contact and whatever you send after this goes directly to the National Meteorological Center computer and all it wants is the weather report. Start with your call sign and send the weather message. At the completion of the weather message add..... No carriage return, no additional sign off call sign, no answer back number -- just five periods.

Most do very well and your efforts are greatly appreciated. Using one report on the top of the stack the report should look like this. (I purposely scrambled the call sign -- but you know who you are.) The "41" doesn't always print out.

+

NWS OBS MHTS

WLXX 29003 99131 70808 41998 60909 10250 2021/ 40110 52003 7161/ 85264 22234 00261 20201 311/ 40803 5////.....

The INMARSAT procedures are perfect. However, the observers need to read up on the weather group and not send any group that is all slashes, i.e., 5/////.

Tips to the Radio Officer

Julie L. Houston
National Weather Service, NOAA
Silver Spring, MD

CORRECTIONS TO WORLDWIDE MARINE WEATHER BROADCASTS (January 1984 Edition)

Radiotelegraph Broadcasts Section 1

Pages:	78-81, 86-88
TIME:	0100
PRODUCT:	F,W
AREA:	Northwest Pacific; Ocean Area Equator - 50N, West of 180.
FREQUENCY:	466
SOURCE:	NRV, Guam Marianas Is.
TIME:	0800
PRODUCT:	F,W
AREA:	Northwest Pacific; Ocean Area Equator - 50N, West of 180.
FREQUENCY:	466
SOURCE:	NRV, Guam Marianas Is.
TIME:	0300
P@ODUCT:	F,W
AREA:	Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY:	8150, 21760
SOURCE:	NRV, Guam Marianas Is.
TIME:	0300
PRODUCT:	W
AREA:	Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY:	466
SOURCE:	NRV, Guam Marianas Is.

TIME: 1300
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY: 466
SOURCE: NRV, Guam Marianas Is.

TIME: 1300
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 466
SOURCE: NRV, Guam Marianas Is.

TIME: 1700
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of !80 and Indian Ocean.
FREQUENCY: 466
SOURCE: NRV, Guam Marianas Is.

TIME: 1700
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 466
SOURCE: NRV, Guam Marianas Is.

TIME: 2200
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY: 8150, 21760
SOURCE: NRV, Guam Marianas Is.

TIME: 2200
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 8150, 21760
SOURCE: NRV, Guam Marianas Is.

TIME: 0300
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 0300
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 1300
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 1300
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 2200
PRODUCT: F,W
AREA: Northwest Pacific; Ocean Area Equator - 50 N, West of 180 and Indian Ocean.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 2200
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 1700, 4445, 10440.5, 12867 (Stand by), 7423.5, 15925, 18321.5
SOURCE: NPO, San Miguel, Philippines

TIME: 0300
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 8150, 2!760
SOURCE: NPN, Guam, Marianas Is.

TIME: 1300
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 8150, 21760
SOURCE: NPN, Guam, Marianas Is.

TIME: 1700
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 8150, 21760
SOURCE: NPN, Guam, Marianas Is.

TIME: 2200
PRODUCT: W
AREA: Southwest Pacific; Ocean Area Equator - 50 S, West of 180.
FREQUENCY: 8150, 21760
SOURCE: NPN, Guam, Marianas Is.

Radiofacsimile Broadcasts Section
Page 141
NAM, Norfolk, VA
NOTE:
FREQ/TIMES
3357 (00Z-12Z), 8080 (cont.)
12865 (cont.), 16410 (12Z-18Z)
20015 (18Z-00Z) Delete all others

ADD:
PRODUCT: K
AREA: Western Med/Eastern Atlantic
SOURCE: GXH, THURSO, SCOTLAND
FREQ/TIMES: 3731, 8000, 18245
NOTE: This is a satellite Backup Intermediate Broadcast. It will have the same times as Norfolk.

Page 144
AOK, ROTA, SPAIN
NOTE:
FREQ/TIMES
4704 (18Z - 06Z), 7669.5 (OR)
9875 (cont.), 17585 (06Z - 18Z)
22805.5 (OR)

Pages 150-151
NGR, ATHENS, GREECE
NOTE:
FREQ/TIMES
4053.5 (18Z - 06Z), 7453 (cont.)
8506 (OR) 12759 (06Z - 18Z)
20470 (OR)

Pages 154-156
NPN, GUAM, MARIANAS IS.
NOTE:
FREQ/TIMES
4975 (cont.), 7894 (cont.)
10255 (cont.), 15990 (cont.)
19860 (cont.), 22910 (cont.)

ADD: The following are new entries that consist of a rebroadcast of Guam products. (Product codes will be the same as Guam).

ADD:
PRODUCT: WRNGS
AREA: Western Pacific
SOURCE: NPO Philippines
FREQ/TIMES: 3377.5 (1000Z - 2200Z)
10966 (cont.), 13395 (cont.)
22865 (2200Z - 1000Z)

Page 158-160
NPM, HONOLULU, HAWAII
NOTE:
FREQ/TIMES
2122 (06Z - 16Z), 4855 (LSB) 9396 (cont.) 14826 (cont.), 21837 (1700Z - 0630Z)

NOD, ADAK, ALASKA
NOTE:
FREQUENCY
8494 (cont.)

NOTE:
New Schedule for Point Reyes, CA (NMC)

Pages 159-160
TIME: 1500Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1503
PRODUCT: MMLD
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1513
PRODUCT: EXP
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1523
PRODUCT: EXP
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1715Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1718
PRODUCT:
AREA: 20S-30N, East of 160W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1728
PRODUCT: A(12)
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 1738
PRODUCT:
AREA: 20S-30N, East of 160W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA USA

TIME: 2000Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2003
PRODUCT: K
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2013
PRODUCT:
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2023
PRODUCT:
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.
SOURCE: NMC, San Francisco, CA, USA

TIME: 2330Z
PRODUCT:
AREA:
FREQUECCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2333
PRODUCT:
AREA: 20S-30N, East of 160W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2343
PRODUCT: A(18)
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 2353
PRODUCT: EXP
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0100Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0103
PRODUCT:
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0113
PRODUCT:
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0123
PRODUCT: EXP
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0300Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0303
PRODUCT: SST
AREA: 40N-52N, East of 135W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0313
PRODUCT: SST
AREA: 28N-40N, East of 136W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0323
PRODUCT:
AREA: 40N-52N, East of 135W
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0333
PRODUCT:
AREA: 28N-40N, East of 136W
FREQUENCE: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0500Z
PRODUCT:
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0503
PRODUCT: A(00)
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0513
PRODUCT:
AREA: 30N-60N, East of 160E
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

TIME: 0523
PRODUT@: EXP
AREA:
FREQUENCY: 4346.0 8682.0 12730.0 17151.2
SOURCE: NMC, San Francisco, CA, USA

ADD:
PRODUCT: WRNGS
AREA: Northern pacific, Sea of Japan
SOURCE: NDT, JAPAN
FREQ/TIMES: 12777 (cont)

ADD:
PRODUCT: WRNGS
AREA: Indian Ocean
SOURCE: NKW, DIEGO GARCIA
FREQ/TIMES: 4235 (1400Z - 0200Z), 15564 (0200Z - 1400Z)

ADD:
PRODUCT: WRNGS
AREA: Indian Ocean
SOURCE: NCW, Harold E. Holt, Australia
FREQ/TIMES: 9498.5 (10-22Z), 12673.5 (cont.), 17060 (22Z - 10Z)

NAVY FACSIMILE SCHEDULE, NORFOLK, VA. EFF. 2/01/85

NAVAL EASTERN OCEANOGRAPHY CENTER, NORFOLK, VIRGINIA
NFAX BROADCAST SCHEDULE
EFFECTIVE 01 FEB 85

TOT (Z)	TRANSMISSION CONTENT	V.T.
0000/1200	500MB HT/TEMP/WIND 24HR PROG	12/00
0015/1215	400MB HT/TEMP/WIND 24HR PROG	12/00
0030/1230	300MB HT/TEMP/WIND 24HR PROG	12/00
0045/1245	200MB HT/TEMP/WIND 24HR PROG	12/00
0100/1300	GOES SATELLITE PICTURE	
0115	NMC EXTENDED SFC/UA PROG	
1315	NMC 200MB TROP ANAL	00
0135	SST GULF STREAM ANAL FULL (SAT)	
	TSGS (SUN/THURS)	
	FAX SCHEDULE (MON,TUES,WED,FRI) (NFAX)	
1335	SST GULF STREAM ANAL I (MON)	
	PLD (TUES/FRI)	
	OPEN PERIOD (WED,THURS,SAT,SUN)	
0150	TSMS (MON/FRI)	
	TSIB (TUES/SAT)	
	OPEN PERIOD (SUN/WED/THURS)	
1350	SEA TEMP ANAL (MON/THURS)	
	TSNF (TUES/SAT)	
	OPEN PERIOD (SUN/WED/FRI)	
0205/1405	500MB HT/TEMP/WIND 48HR PROG	12/00
0220/1420	NEOC 36HR PROG BLEND	00/12
0235/1435	NMC RADAR SUMMARY	
0245/1445	GOES SATELLITE PICTURE	
0300/1500	FREEZING LEVEL 24HR PROG	00/12
0315/1515	NMC SIG WX 12HR PROG (SFC-400MB)	12/00
0325/1525	OPEN PERIOD	
0335/1535	NMC 24HR 500MB HT CHANGE	00/12
0350/1550	NEOC NEPHANALYSIS	
0410/1610	NMC N ATL SFC ANAL	00/12
0430/1630	NMC LFM 24HR PROG	00/12
0445/1645	DMSP SATELLITE PICTURE	
0500/1700	NMC RADAR SUMMARY	
0505/1705	OPEN PERIOD	
0515/1715	SFC TROP ANAL	
0530/1730	BRACKNELL 24HR SFC PROG	00/12
0545/1745	GOES SATELLITE PICTURE	
0600/1800	NMC LFM 48HR PROG	00/12
0615	OPEN PERIOD	
1815	NEOC SEA HEIGHT ANAL	12
0635/1835	850MB HT/TEMP/WIND ANAL	00/12
0650/1850	700MB HT/TEMP/WIND ANAL	00/12
0705/1905	500MB HT/TEMP/WIND ANAL	00/12
0720/1920	300MB HT/TEMP/WIND ANAL	00/12
0735/1935	NMC RADAR SUMMARY	
0740/1940	SFC PRES/WIND 12HR PROG	00/12
0755/1955	SFC PRES/WIND 24HR PROG	00/12
0810/2010	OPEN PERIOD	
0820/2020	NMC 24HR SIG WX	00/12
0830/2030	NMC 36/48HR SIG WX	
0840/2040	NMC RADAR SUMMARY	
0845/2045	DMSP SATELLITE PICTURE	
0900/2100	NMC ANAL TROP OCEAN LWR LYR	00/12
0915/2115	OPEN PERIOD	
0925/2125	SFC PRES/WIND 48HR PROG	00/12
0940/2140	SFC PRES PRELIM	06/18
0955/2155	GOES SATELLITE PICTURE	
1010/2210	SIG WAVE HT 24HR PROG	00/12
1025/2225	850MB HT/TEMP/WIND 36HR PROG	12/00
1040/2240	500MB HT/TEMP/WIND 36HR PROG	12/00
1055/2255	NMC 36HR 500MB HT/TEMP PROG	12/00
2305	BRACKNELL 48HR SIG WAVE PROG	12
1115/2315	DMSP SATELLITE PICTURE	
1130/2330	850MB HT/TEMP/WIND 24HR PROG	00/12
1145/2345	700MB HT/TEMP/WIND 24HR PROG	00/12

FREQS	TIMES	FREQS	TIMES
8080, 10865	CONTINUOUSLY	16410	1200Z-0000Z
3357	0000Z-1800Z	20946	1800Z-0000Z

The Editor's Desk

NWS AND NOS TEAM UP FOR CHICAGO BOAT SHOW

The Chicago Boat Show, January 9-13, 1985, is held annually at McCormick Place, along Chicago's Lakefront, is one of the largest boat shows in the country. The show ranks in the top 5 largest in the country.

The National Weather Service, Chicago, and the National Ocean Service, Rockville, Maryland, combined efforts to run a display and information booth at the show (fig. 28). From NOS, Donald Clements, Dick Moyars and Howard Danley, were very knowledgeable in Nautical Charting. John Orgler, PMO, provided the information and answers to the questions people had about the Weather Service. The questions asked the most frequently were about the proposed price hikes in charts, the possibility of larger budget cuts and loss of information broadcast by the Weather Service, how NWS and NOS fit in the government structure, and finally how pleased the boating community is with KWO-39, Chicago's NOAA Weather Radio, and the information that is broadcast.

With the lakes frozen the PMO, who normally works with merchant shipping and would be on the docks, was free to man the NWS booth. PMO's visit merchant shipping both foreign and domestic to encourage the mates to make and report weather observations in the WMO ships synoptic code. These reports are the basis for weather forecasts on the lakes.

Figure 28.-- The display at the Chicago,IL show.

FLORIDA COASTAL CURRENT INFLUENCES WORLDWIDE CLIMATE

Clues to better prediction of global climate conditions are being sought in the Gulf Stream off Florida's Atlantic Coast by scientists of the National Oceanic and Atmospheric Administration.

They are seeking ways to determine how much warm water is being carried northward at a given time by the familiar ocean current. Global heat distribution is one factor influencing climate, and the oceans are believed to play a large role in moving heat from the tropics to the temperate zones. Monitoring this heat movement is thus considered of major importance, according to Dr. Robert A. Molinari of NOAA's Atlantic Oceanographic and Meteorological Laboratory in Miami.

A variety of innovative devices, including an abandoned submarine cable between Florida and the Bahamas and a new shore-based instrument that gives automatic readings of both tide height and basic weather conditions, are being used by a team from NOAA's Environmental Research Laboratories and the University of Miami.

The team is focusing upon Florida's Atlantic coast for several reasons. The Atlantic probably transports more heat northward than does the Pacific. There are indications the largest poleward transport occurs between 20° and 30°" which in the western North Atlantic is from just south of Cuba to an area off Jacksonville, Fla. And, finally, in that area the biggest contribution to the northward heat flux is associated with the Florida Current, part of the Gulf Stream.

Several methods are being tested to determine the best for long-term measurement of the Current. One measures cross-stream voltages, using an abandoned submarine telephone cable as a lead to measure voltage differences across the current. The other provides sea level data and meteorological conditions from an instrument installed at a municipal pier in Lake Worth, Fla. Both methods require calibration with data from direct-measurement instruments such as bottom-moored pressure gauges, and other devices on moored buoys and aboard ships.

The submarine telephone cable runs between Jupiter Inlet, Fla., and Settlement Point on Grand Bahama Island. Electrical voltage differences -- caused by movement of the seawater through the Earth's magnetic field -- are measured and converted to give the volume of water being transported north through the Florida Straits. The calibrated cable data is as accurate as that obtained by direct measurement.

Sea level changes, which can be determined by a tide gauge, also are believed to indicate the volume transport of the Gulf Stream, said Dr, George A. Maul of the Miami laboratory, but data from surface tide gauges are affected by local weather conditions. To accommodate this problem, NOAA's Data Buoy Center developed the so-called C-Man gauge installed at Lake Worth. It automatically records both sea level and weather information, permitting those monitoring the sea level to adjust their calculations for weather conditions.

The effort is part of NOAA's Subtropical Atlantic Climate Studies program which seeks to identify oceanic processes contributing to most of the poleward transport of heat, and to develop techniques for their operational monitoring.

RECORD ARCTIC BLAST STRIKES MOST OF THE U.S.

Temperature records fell in more that 80 cities on Inauguration Day, Monday, January 21, 1985, as a frigid arctic air mass encased most of the Nation east of the Rockies. Subzero temperatures combined with strong winds produced wind chill values of 60°F below zero or lower over portions of the Ohio and Tennessee Valleys

northeastward. Akron, Ohio, and Knoxville, Tennessee, tied at 24°F below zero for the official coldest spot in the Nation on Monday. The wind chill at Pittsburgh, Pennsylvania, was 68° below zero. The icy blast laid a blanket of snow across many sections of the east and heavy snows through the Appalachians and the lee of the Great Lakes, with a rare snowfall in New Orleans, Louisiana. Presidential inauguration ceremonies were moved indoors and the parade canceled because of the frigid conditions in Washington, D.C. It was the coldest Inauguration Day on record. The media reported 49 weather-related deaths across tne Nation during the weekend, and the Florida citrus industry was threatened by subfreezing temperatures.

SAILS SAVE FUEL

The Japanese cargo ship USUKI PIONEER equipped with a computerized sailing system arrived at the Seattle waterfront December 10, 1984. The fuel-saving ship completed its maiden voyage from Tokyo to Seattle in 15 days (fig. 29)

The ship has 22 crewmen and an average speed of 13.5 kn and is 26,000 tons.

Use of the mechanized sails cut fuel consumption about 30 percent on the first trip.

Power from the sails is augmented by two 6,000 horsepower diesel engines. With good winds the power can be reduced. The sails are controlled from the bridge by computers by computing the optimum angle. Other computers adjust the engine speed, keep logs and handle navigation.

Two other sail-assisted ships are under construction, a 60,000 ton cargo and 90,000 oil tanker.

Figure 29.-- The USUKI PIONEER at Seattle. Photo by Peter Haley, Journal-American.

Ticktock...Ticktock

Wherever you may be in this big old world, the clocks ticks...but what time is it? To answer that question, 22 nations met at an international conference in Washington, DC, on 13 October 1884, and established Greenwich Mean Time (GMT), the international standard upon which time zones around the globe are based. The Greenwich meridian is an invisible line that circles the Earth from North to South poles and thus separates the world into hemispheres. The meridian that passes through the Royal Observatory at Greenwich, England, is the globe's official zero longitude, and timekeepers and navigators everywhere measure their position or time from that point.

NAVOCEANO (Naval Oceanographic Office), with ships and planes on all oceans and areas of the world at any given time, has a keen interest in GMT. As the Earth rotates, the sun passes through 15 degrees of the total 360 degrees each hour. The 24 international time zones correspond to these 15° segments, although the line zigzag to accomodate individual countries. This, NSTL, which is near 90°W longitude, is six hours and six time zones behind GMT. Halfway around the globe from Greenwich, at 180° longitude, the eastern and western time zones meet, with one 12 hours ahead of GMT and the other 12 hours behind. This line is called the International Date Line.

A traveler crossing the line from east to west advances into the next calendar day, and from west to east drops back a day.

Now, let me see, what day IS this? Wednesday or is it Thursday...

From the NAVOCEANO Bulletin.

GULF COAST INSIGNIFICANT AS SOURCE OF ACID RAIN

Natural sources along the Gulf of Mexico coast have been ruled out as a significant air pollutant factor in southeastern United States by a NOAA study conducted this past summer.

NOAA scientists from the Environmental Research Laboratories in Boulder, Colo., said that compared to man-made sources, nature's concentrations of sulfur in the lower atmosphere over the Gulf Coast were so small they were of no significance. A single power plant, burning low sulfur coal, will put half again as much sulfur into the atmosphere in a year as all the natural sources along the Gulf Coast.

An August airborne collection of samples over wetlands coastal waters near New Orleans was part of the National Acid Precipitation Assessment Program, a multi-agency investigation of acid rain in the United States. In that program, NOAA is responsible for investigating natural sources of chemicals contributing to acid rain, and the movement of these chemicals through the atmosphere.

Earlier, some scientists had theorized that high levels of sulfur measures in the atmosphere southwest of Nashville, Tenn., might have come from natural sources. The Gulf study indicates the concentration is man-made.

The results of the Gulf study compare favorally with earlier measurements of sulfur concentrations in polluted and non-polluted air masses conducted at Whiteface Mountain in upper New York state.

MARINE WEATHER REVIEW

The Weather Logs combined with the cyclone tracks, U.S. Ocean Buoy climatological data, gale and wave tables, and mean pressure patterns are a definitive report on the weather systems and primary storms which affected the North Atlantic and North Pacific Oceans during this 3-mo period. Hurricane Alley lists and describes tropical cyclones worldwide. Unless stated otherwise, all winds are sustained winds and not gusts; all times are G.M.T.

North Atlantic Weather Log
July, August and September 1984

WEATHER LOG, JULY 1984 -- Significant extratropical cyclones were scarce this month over the ocean. There was only one along the east coast of the United States. Several moved across the Labrador Sea and two continued to the Norwegian Sea. There were two cutoff LOWs northeast of the Azores.

The Azores High at 1026mb was the primary feature on the mean sea-level pressure chart for the month (fig. 30). It was near normal in both pressure and location near 36°N,38°W. There was an anomolous 1020 mb high pressure center over Brest France and a 1018 mb HIGH over Scoresby Sound of Greenland. There were two 1007 mb LOWs, one over the eastern shore of Hudson Bay and the others on the Finnish-Russian border. The climatic Icelandic Low over Iceland was missing.

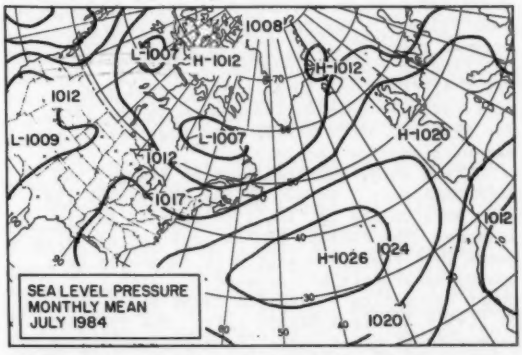


Figure 30.-- Monthly mean sea-level pressure July 1984.

There were no outstanding anomaly pressure centers. The highest was plus 5 mb off northern Ireland. There was a minus 4 mb center near Leningrad. The only other anaomaly center that could have had a significant affect on the marine weather was a fairly large area with two plus 3 mb centers off the east coast of the United States and southeast coast of Canada.

There were some significant differences from climatology in the upper air flow at 700 mb. The subtropical Atlantic High and High over Algeria were both higher than normal 200 mi further north.

There was an anomalous LOW over the Davis Strait. The normal trough along the U.S. East Coast was shifted west of the Appalachian Mountains. The normal trougning south of 50°N off Spain was deeper than normal and north of 50°N there was an anomalous ridge.

The first tropical cyclones did not occur until August.

Some climatology. On July 4, 1776 Thomas Jefferson signed the Declaration of Independence and paid for his first thermometer, according to his weather log at 2 pm it was cloudy and 76°. A weather diary kept by George Washington records that on July 23, 1788 the center of a hurricane passed directly over Mount Vernon. Norfolk, VA reported houses destroyed, trees uprooted and crops leveled. On the 27th, 1926 a hurricane moved inland near Daytona Beach, Fla. causing extensive damage. On the 28th, 1819 an intense hurricane moved ashore over Bay St. Louis, Miss. Many houses were destroyed. A U.S. Cutter with 39 crew members was lost. Hurricane Camille hit the same area 150 yrs. later.

Extratropical Cyclones -- The month started with HIGHs east of Bermuda and south of Iceland. There were small LOWs from Virginia to 55°N., 30°W. At midweek a LOW had consolidated 500 mi southeast of Kap Farvel. A U-shaped ridge of high pressure stretched from the southeastern United States to Iceland. By the end of the week the HIGH centers near Bermuda had built northeastward, another LOW had pushed eastward along latitude 55°N, and the HIGH near Ireland had moved to the Baltic Sea.

The second week featured a stationary HIGH southeast of Cape Race. A high-pressure center moved south over the Mediterranean. A LOW was moving northward off the west coast of Europe. By the end of the week the HIGH had moved to midocean near 45°N, 30°W. LOWs were over Quebec, Canada and Scandinavia.

The Bermuda High center developed the third week, LOWs and frontal waves were scattered along and between latitudes 5°N and 65°N. The Bermuda High drifted northeastward to 40°N, 55°W by the end of the week. Another HIGH was over Rockall Bank. There was a cutoff LOW west of Cape Finisterre.

Except for a large Bermuda-Azores High south of latitude 45°N the weather pattern was broken into many small centers the first of the fourth week. By midweek three centers had consolidated. A large LOW was moving eastward

from Labrador. At the end of the week the HIGH centers were over midocean and the Brest Peninsula. The LOW broke up over Kap Farvel and another had formed over the Denmark Strait and moved eastward. At the end of the month there was a HIGH over midocean and weak LOWs over the north latitudes.

The first significant cyclone of the month grew out of several weak LOWs and frontal waves. When it consolidated on the 1200 chart of the 3d it was near 48°N, 33°W at 993 mb. The DEFIANCE (42°N,36°W) had 40-kn west winds and 13-ft. swells. By 1200 on the 4th the storm was 986 mb. The FEDERAL THAMES (56°N,39°W) measured 36-kn winds, 17-ft seas, and 23-ft swells. At 0000 on the 5th CHARLIE measured 33- kn west winds and 20-ft waves. The storm weakened on the 5th as it was squeezed between HIGHs on the east and southwest and another LOW approaching from the west.

This tight gradient was the result of the pressure gradient between a front and the Bermuda High. There was a broad-flat low pressure area northwest of the front which had frontal waves rippling along it. At 1200 on the 5th SEDCO 706 reported 38-kn southwest winds south of the front. On the 6th the BAFFIN (50°N,55°W), measured 41-kn winds. The KNDH (44°N,60°W) had 38-kn southwest winds. On the 7th at 2100 (fig. 31) the VINLAND (44°N,60°W) measured only 24-kn southwest winds but reported 33-ft seas. The seas seem very high but I wasn't there, maybe a freak type wave. At 0600 on the 8th the KMHF (44°N.58°W) had only 29-kn measured winds from 220° and reported 49-ft swells from 250°. At 1800 the AL AHMADIAH (39°N,67°W) had 44-kn south winds and 25-ft seas with heavy rain. On the 9th the gradient slackened.

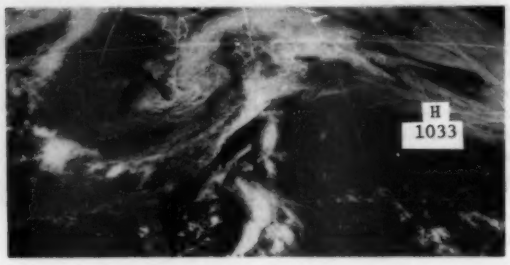


Figure 31.-- The high winds were in the clear area between the HIGH and the front. NOAA.

The 1200 chart of the 8th indicated the rapid formation of a new LOW west of the Bay of Biscay. The upper air chart showed a distinct sharpening of the trough associated with a LOW to the north. The CAROLINA (45°N,16°W) had 40-kn south winds and 13-ft waves. ROMEO had 39-kn west winds and 20-ft seas. At 0000 on the 9th her winds were 35-kn with 21-ft seas (fig.32). The GORNY SLASK (49°N,05°W) had 39-kn winds from the southwest on the 10th. The PACIFIC CHALLENGE (46°N,17°W) found 21-kn west winds and 21-ft waves. The storm dissipated on the 11th.

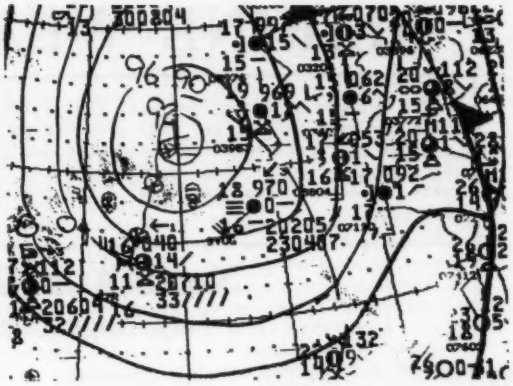


Figure 32.-- The 1200 chart of the 9th.

This storm formed over Hudson Bay on the 22nd. At 1200 on the 24th the storm was over Hamilton Inlet. The KNDH and the VNCP both had gales near 35 kn near 44°N,60°W. The JOHAN PETERSEN (59°N,46°W) found 44-kn easterly winds and 17-ft seas on the 25th. The RIGGS on the Grand Banks had gales averaging 35kn. The LOW dissipated on the 27th near Kap Farvel.

Casualties -- The following two ships had encountered with ice. The ARCTIC VIKING hit an iceberg off the Labrador coast on the 17th. The J.A.Z. DESGAGNES encountered ice on the 23rd and returned to Montreal.

These ships collided in fog. The DAUKA and HARMATTAN were in collision in fog 3 mi north of Cabo Villano. The DAUKA sank with only one crewman rescued. The FUNCHAL and STORHAUG collided on the 11th off Molde, Norway. The VASYA ALEKSEEV and ROYAL ODYSSEY collided in misty weather outside Copenhagen on the 11th. The RHIN and HAPPY SPRITE came together in the Bay of Biscay on the 28th.

These ships suffered weather damage: the ALKHANSAA July 7 to 10, SELMAR ENTERPRISE the 9th, ANTACUS the 13, 14, 15th area of Scilly Islands. The PANBALI KAMARA capsized off Sierra Leone in a storm and sank with 70 people on board, apparantly all drowned.

Other casualties -- The YEE CHANG No. 3 near 34°S,45°W issued a Mayday call. The YUNG YU answered and towed vessel to Montevideo on the 4th. The MARIA RAMOS sank in high seas off southern Brazil on the 24th.

WEATHER LOG, AUGUST 1984 -- There were more than the normal number of extratropical cyclones this month. The primary path for those that affected the major shipping lanes was from Nova Scotia to 50°N,40°W to the Denmark Strait. This closely paralleled the primary climatological path. There were several storms off the east coast of the United States. Only one of these tracked eastward beyond longitude 50°W. Two storms tracked into Europe. There were a significant number of cyclones over northern Canada. Most of these turned northward over Baffin Bay.

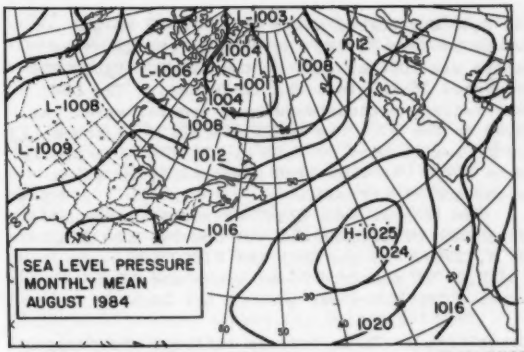


Figure 33.-- Mean sea-level pressure, August 1984.

The mean sea-level pressure chart reflects the track of these storms as the Icelandic Low at 1001 mb is shifted from its climatic 1008 mb position south of Iceland to 0°N,70°W (fig.33). The Azores High was 1025 mb near 39°N,29°W. This was 2mb higher and 600 mi northeast of its normal location.

The sea-level pressure anomaly chart indicated two significant departure areas, a minus 9 mb centered over the Baffin Bay and a plus 7mb centered over the North Sea near Dundee Scotland. The anaomalous LOWs off the U.S. East Coast were reflected only by a broad area of minus 2 mb.

The upper-air pattern at 700 mb was near normal west of longitude 40°W. The primary center of circulation was over Baffin Bay but about 100 m lower than normal. There was a long-wave trough from the LOW southward across eastern Quebec and off the east coast of the United States. There was the usual trough off the west coast of Spain but the trough normally over Ireland was shifted westward which also shifted the normal ridge from Finland to Norway.

There were three tropical storms this month; Arthur, Bertha, and Cesar.

Some Climatology. On August 9 in 1882 a snowstorm was reported by a ship on Lake Michigan. Snow showers were also observed at shore points. On the 17th in 1969 Camille struck the Mississippi coast. It was the second worst hurricane in U.S. history. Winds gusted to 172 mi/hr at Main Pass Block, La. and to 190 mi/hr near Bay St. Louis, Miss. The hurricane claimed 256 lives. Several days later the remnants struck Virginia and flooding caused the death of 113 persons. On the 26th a hurricane made landfall at Delray Beach, Fla. Winds reached 153 mi/hr at Jupiter Lighthouse before the anemometer failed.

Extratropical Cyclones -- The month started with a high pressure ridge along longitude 30 W. There were LOWs on both sides of the ridge. By midweek the Azores High had built and expanded into a more circular configuration. Cyclones were blocked to north of latitude 60°N/ At the end of the week the 1034mb HIGH was centered near 46°N,23°W.

The second week the HIGH continued to build to 1036 mb near 45°N,25°W. High pressure dominated the ocean between latitudes 20° and 40°N except for a week low pressure area off Cape Hatteras. There was a significant LOW north of Iceland. At midweek there was a strong LOW centered over southern Greenland. The Azores High had retrograded to 40°N,45°W. At the end of the week the HIGH was broken into multiple centers all below 1030 mb.

Early in the third week low pressure and cyclonic circulation developed over the northern midocean between high pressure cells. A large LOW developed by midweek but a high over the English Channel blocked eastward movement. The Azores High again consolidated and was building at the end of the week near its normal position.

At the beginning of the fourth week a HIGH moved out of Canada and moved eastward over Iceland. The two HIGHs were connected along longitude 25°W. A LOW was following along latitude 53°N but turned northward late in the week. At the end of the week the Azores High was near 40°N,20°W and LOWS and frontal waves were penetrating much farther south. The end of the month the pressure pattern had broken into multiple centers.

At 0000 on August 1 this LOW was 1006 mb near 50°N,21°W. On the 2nd the TFL EXPRESS (51°N,17°W) measured 46-kn winds from the north. Later in the day the AMCO VOYAGER had 35-kn winds with 17-ft waves that continued into the 3rd. The SEA-LAND INDEPENDENCE at 49°N,12°W had 20-ft swells. The LOW almost dissipated on the 4th but was able to maintained its identity as it turned northward and moved over Norway.

On the 5th there was an area on the west side of the Azores High that supported gale-force winds. There was a weak low to the west but these winds on the 5th and 6th appeared to be associated with the gradient of the HIGH rather than the LOW. The AMERICAN ENVOY (42°N,46°W) reported 40-kn southwest winds and 20-ft swells at 1200. The MARIA J. (45°N,44°W) reported 52-kn winds from the southwest, 13-ft seas, and 17-ft swells. On the 6th a front had formed and the LOW raced northward as a frontal wave. The AMCO VOYAGER had 35-kn winds from the south, east of the front, with 18-ft swells. The AGPA (62°N,29°W) reported 45-kn winds west the LOW at 0000 on the 7th. At this time the LOW had deepened to 992 mb northeast of Kap Farvel. At 1800 the NORTHERN at 60°N.41°W measured 45-kn winds with only 10-ft seas. On the 8th her winds were 38-kn. The storm continued tracking up the east coast of Greenland.

A frontal wave formed over Canada west of James Bay on the 6th. It tracked southeastward, then over Quebec turn northeastward on the 7th. At 1200 on the 8th it was over the Labrador Sea at 998 mb. The HUDSON at 58°N, 49°W measured 48-kn winds from the east. The visibility was only 200 yd in drizzle. The CHAMAI (45°N,43°W) reported winds near 50-kn for the next 18 hr. On the 9th the HUDSON still measured 48-kn winds but they had switched to the southeast, by 1200 they had decreased to 35 kn. At 2100 the SVENDBORG (59°N,43°W) had 37-kn winds with 20-ft

seas. On the 10th the NANOK S. (60°N, 37°W) had 45-kn winds with 25-ft seas. The SVENDBORG now had 44-kn winds and 20-ft seas. The storm continued northward up the coast of Greenland.

This storm originated over the Gulf of Alaska on the 5th. It traveled across Canada and started affecting the Labrador Sea on the 10th. The 1200 chart of the 11th indicated the LOW was near Godthab, Greenland and another center had formed northeast of Kap Farvel. This new center became the primary storm. The NORTHERN (60°N,42°W) reported the highest wind for the day of 50 kn. The MEERKATZE (60°N,30°W) had the highest waves of 17 ft. At 0000 on the 12th the storm was 973 mb near 63°N,38°W. The NAOK S. found 52-kn west winds near 60°N,47°W and 26-ft seas. The CHARLOTTE BASTIAN (57°N,36°W) also had 52-kn winds with 20-ft swells. There were many gale to strong gale wind reports and wave reports up to 20 ft. The FORT FRASER has 46-kn winds, 12-ft seas, and 26-ft swells on the 13th near 55°N,29°W. On the 14th the storm was weakening rapidly but there were still some swell reports near 20 ft.

Lake Superior produced this cyclone late on the 17th ALGOCEN measured 36-kn winds on the 19th in Lake Erie. It tracked southeastward and crossed the coast near Atlantic City at 0000 on the 20th as a weak 1008 mb frontal wave. It deepened as it moved northeastward and was 998 mb over Newfoundland at 0000 on the 22nd. The KMHF (45°N,58°W) measured 48-kn winds and 21-ft seas. On the 23rd the TEXAS TRADER (42°N,47°W) had 30-kn winds and 21-ft seas. The AMERICAN PURITAN (45°N,28°W) had 40-kn winds on the 24th. The storm disappeared on the 26th.

The Great Lakes basin also produced this storm that was first analyzed on the 0000 chart of the 23rd. A weak LOW crossed the coast at Portsmouth, N.H. at 0000 on the 24th. Late on the 25th (2100) four ships and rigs near 47°N,48°W reported winds of 40 to 45 kn and waves of 7-to-10 ft. At 0000 on the 26th the storm was 1006 mb east of Cape Race. SEDCO 706 reported 38-kn winds and 12-ft seas. The LOW was racing northeastward as a frontal wave. At 0000 on the 27th the QUEEN ELIZABETH II found 30-ft swells near 50°N,23°W, At 1800 the swells were 20ft. At 1200 LIMA measured 35-kn south winds and 15- ft seas.

The frontal wave absorbed a stationary LOW southeast of Iceland and was now 994 mb LOW at 61°N, 25°W. On the 28th the DISCOVERY (58°N,08°W) measured 35-kn winds and 17-ft waves. The storm was gone on the 29th.

Casualties -- These vessels suffered ice damage. The JACQUES DESGAGNES sustained ice damage the 5th to 7th from the St. George River to Aupaluk Bay. The OCEAN PRAWNS sank on the 16th in Davis Strait when ice punctured a hole in her hull in heavy seas. All 28 crewmen were rescued by the FAME. The EVANGELIA C. sustained heavy ice damage in Hudson Strait. The CAROLINA F. had ice damage during a ballast voyage to Churchill.

The ISLAMAR TERCERO sank 70 mi south of Las Palmas on the 10th when her cargo shifted in high winds. Twenty six crewmen died with only one survivor.

The SEMLOW and FRAMNAS collided in fog near Grunenthal bridge on the 19th. The CHEVRON ROME was struck by the OREGAN when she dragged anchor in a wind squall. Six men were rescued by the AMERICAN PIONEER when the yacht DOUBLE BULLET flipped in storm seas.

The ferry OLAU BRITTANNIA carrying more than 1,000 passengers and the MONT LOUIS with a radioactive cargo collided in limited visibility 12 mi off the Belgian coast on the 25th (fig.34). The MONT LOUIS sank in 46-ft of water. No one was hurt.

Other casualtities -- The LADY ISABEL had damage off the coast of Brazil on the 5th. The SUPREME TIDE grounded on the 26th near 22°S,

Figure 34.-- The ferry OLAU BRITTANNIA with its bow deep into the freighter MONT LOUIS off the Belgian coast. The MONT LOUIS sank. None of the more than 1,000 passengers were hurt. Wide World Photo.

41°W. The AL RAYYAN encountered storm-force winds and heavy seas in the South Atlantic and sustained damage and flooding.

WEATHER LOG, SEPTEMBER 1984 -- This was a fairly normal month across the water. There were several deep severe storms that affected shipping. There were five tropical storms this month. The primary extratropical cyclone path extended from about Sable Island northeastward to about 55°N,15°W. There were quiet a few cyclones over east central Canada but few tracked south of Kap Farvel. Two storms in the first week tracked across the United Kingdom into Scandinavia.

The mean sea-level pressure chart was near normal (fig.35). The Icelandic Low at 1004 mb was near the normal 1005 mb central pressure and the 62°N,30°W position. There was an anomalous 1006 mb subcenter near the Shetland Islands. The Azores High at 1023 mb was 2mb higher than the normal and at 40°N,30°W was about 300 mi north of the normal position.

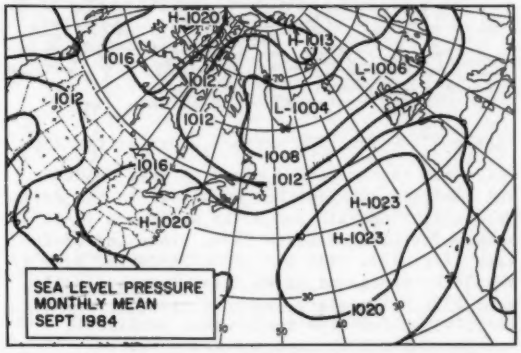


Figure 35.-- Mean sea-level pressure September, 198

There were two significant anomaly centers, a minus 7 mb over north Poland and a plus 4mb near 45°N, 22°W.

In the upper air at 700 mb the primary LOW was over Bafflin Bay. A trough stretched southward across Labrador to near 40°N,62°W. There was a ridge along longitude 15°W and another long-wave trough along longitude 10°E. This pattern shifted the trough lines 10° to 20° east of the normal positions.

The five tropical cyclones were hurricane Diana and tropical storms Edouardo, Fran, Gustav and Hortense.

Some climatology -- On September 2, 1935 an intense hurricane struck the Florida Keys with 200 mi/hr winds and a 15-ft tide. Four hundred perished in the storm. At Matecumbe Bay the pressure plunged to 26.35 in (892mb). On the 22d in 1938 a great hurricane crossed Long Island and New England. The winds gusted to 186 mi/hr at Blue Hill Mass. On the 23rd in 1815 another great hurricane had nearly the same path. It was one of a series of severe Summer and Autumn storms that year.

Extratropical Cyclones -- The first few days of the month the pressure systems were weak except for the extratropical conversion of tropical storm Cesar. During the week frontal waves and LOWs moved across Europe. By the end of the week the Azores High was 1033 mb near 45°N,35°W.

The first of the second week the Azores High dominated the midlatitudes. Hurricane Diana was the main concern most of the week. The last half of the week the Azores High decreased in strength and moved southward. LOWs moved across the high latitudes. A strong LOW tracked from Newfoundland to Iceland.

The third week the Azores High again built northward and extratropical Diana became a severe storm. At the end of the week there were several LOWs stretched across the north latitudes.

The fourth week found four significant pressure centers over the ocean, two HIGHs and two LOWs. By midweek they were breaking up into multiple centers. At end of the week there were two significant extratropical LOWs between latitudes 55° and 60°N, a weak Azores High and tropical storms Isidor and Hortense. At the end of the month there was a large LOW near Kap Fravel and a large Azores High with Isidor and Hortense off the U.S. East Coast.

By midday on the 1st tropical storm Cesar had become extratropical southeast of Sable Island. On the 2nd the drilling rigs and attendant ships were reporting winds from the east to northeast near 50 kn with waves up to 15 ft. At 0000 on the 3rd the storm was 984 mb near 46°N,47°W. The 50-kn winds continued into the 3rd. the ITALICA (40°N,54°W) found 35-kn west winds with 15-ft seas, and 26-ft swell. The storm continued northeastward through the Denmark Strait.

The next storm formed over James Bay on the 9th. It tracked southeastward to Newfoundland on the 12th. Early on the 13th it deepened rapidly as it moved over the warm water. The ROVER (44°N,48°W) had 30-kn southwest winds, 25- ft seas and 33-ft swells. The VCSB (46°N, 48°W) measured 60-kn northwest winds at 1800 with 17-ft seas. At 0000 on the 14th the storm was 986 mb near 51°N, 40°W. The CAST HUSKY (51°N,44°W) had 55-kn north winds. The FEDERAL MAAS (51°N,30°W) measured 48-kn south winds, 17-ft seas, and 26-ft swells. She still had 30-ft swells on the 15th. The storm was over the Denmark Strait at 1200 and dissipated on the ice cap.

As hurricane Diana was moving up the U.S. East Coast on the 15th the circulation absorbed a frontal system and became extratropical on the 16th. At 1200 the storm was 996 mb near 47°N,57°W. The KMHF (45°N,58°W) measured 65-kn winds and 20-ft waves. Nearby the KFPN measured 55-kn winds and 20-ft waves. The winds were from 200°. Several other ships had storm-force winds. On the 17th the PREMNITZ (56°N,43°W) measured 64-kn northwest winds but only reported 10-ft waves. The KHANS PEGELMAN (53°N,42°W) reported 20-ft seas.

At 1200 on the 18th the storm was 985 mb on the south coast of Iceland (fig 36). The FALCON

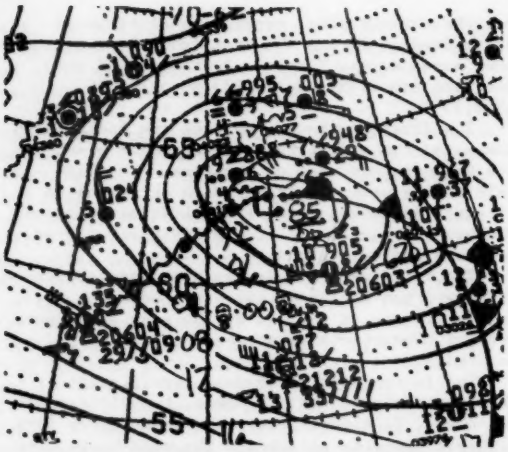


Figure 36.-- The 1200 surface chart on the 18th and the 1704 satellite image. Surface observations are needed to interpret the satellite. NOAA.

(59°N,21°W) reported 52-kn west winds, 13-ft seas, and 33-ft swells. The GRUNDARFOSS (59°N,04°W) had 63-kn south winds. LIMA had 20-ft seas and at 0000 on the 19th, 21ft. The ERNST TELMAN (60°N,17°W) measured 52-kn winds and 20-ft seas. The FALCON now had 37-kn winds and 31-ft swells. On the 20th the original LOW was absorbed in the circulation of a new LOW that formed between Greenland and Iceland. This cyclone produced some gales as it moved north of Scotland.

Another extratropical conversion from a tropical cyclone. This one was from tropical storm Gustav on the 19th. At 1200 on the 20th the storm was 986 mb northeast of Trinity Bay. SEDCO 706 and WGZL both measured winds of 50 kn and 8-ft seas. On the 21st the NUKA ITTIK (54°N,45°W) found 44-kn winds from the northeast with 15-ft seas. The storm quickly dissipated.

A front moving eastward out of Canada was rapidly occluding and late on the 24th a new LOW developed at the point of occlusion. At 0000 on the 25th the storm was 994 mb near 50°N,47°W. The CITY OF PERTH (47°N,36°W) had 40-kn winds.

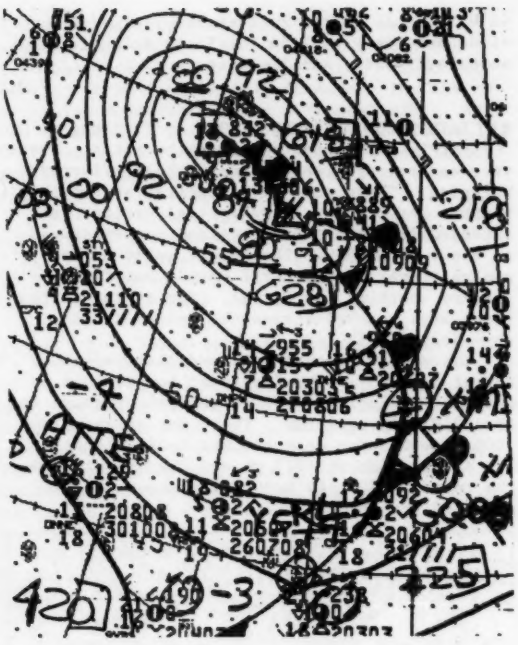


Figure 37.-- The 1200 surface chart of the 26th.

The storm center passed directly over CHARLIE and combined with another LOW later in the day. On the 26th CHARLIE had 35-kn winds and 16-ft seas while LIMA measured 38-kn winds and 13-ft seas (fig. 37). The C.P. AMBASSADOR (52°N,30°W) had 50-kn winds and 23-ft seas, but the swells were 33ft. The storm weakened rapidly on the 28th, but a few high swell waves persisted.

The CMB EUROPE reported heavy weather damage and containers lost overboard on arrival at Montreal.

Casualties -- Fog contributed to damage to three ships this month. On the 1st the VERACRUZ was damaged by an unknown ship near 44°N,09°W. On the 13th the DAWN WARBLER went aground near 53°N.02°E. The LUBECA went aground near Oskarshawn on the 22nd.

The NEYLAND went aground at Mundesley during a gale on the 10th. The BERMUDIANA had weather damage the 6th to 9th enroute from Bermuda to Jacksonville. The HEATHER VALLEY was overcome by three large waves and sank in the North Channel on the 23rd. The crew was picked up by the KNILY LIGHT. The SEA SKIMMER encountered heavy weather on the 16th on a voyage from Houston to Jacksonville.

Other Casualties -- The CHIEN CHUNG apparently sank in high seas and strong winds as they were reported to have halted the search for 21 crew members 350 mi off the coast of Brazil on the 20th. The TRANPORTER II reported weather damage and 26 containers lost overboard on arrival at Buenos Aires on the 25th. The LAODIKI and GUALEGUAYCHU collided in fog on the 28th in the channel to Buenos Aires, the later sank.

North Pacific Weather Log
July, August and September 1984

EATHER LOG, JULY 1984 -- There were few significant extratropical cyclones this month and those were widely scattered. Significant LOWs or frontal waves are defined as those that persist and can be tracked for more than 36 hr. These are the ones that are plotted on the cyclone track charts printed in this publication. Of the siginificant ones only four were strong enough to warrant describing in this log.

The North Pacific was practically dominated by high pressure (fig.38) as climatology indicates. The Pacific High was 1026 mb with two centers, one near 41°N,160°W and the other near 41°N, 146°W.. There were two anomalous low-pressure centers over water, a 1009 mb south of Cape Falso, and a 1007mb south of Japan near 28°N,138°E. Both of these were the result of tropical cyclones. There was an anaomalous trough over the Gulf of Alaska.

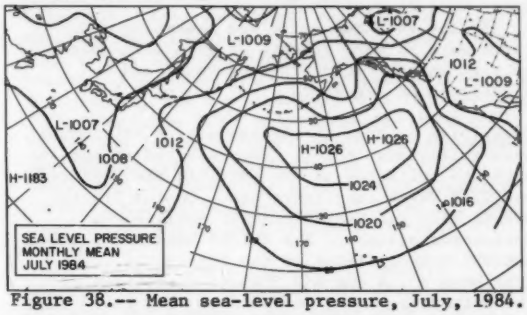


Figure 38.-- Mean sea-level pressure, July, 1984.

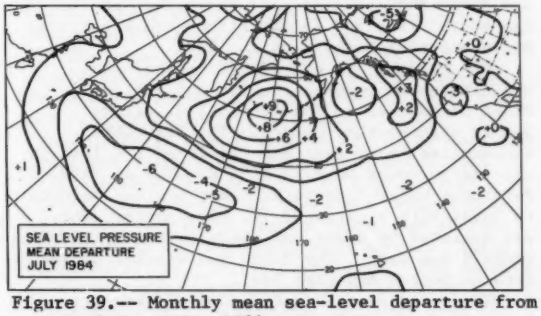


Figure 39.-- Monthly mean sea-level departure from normal for July, 1984

The mean sea-level pressure departure from normal chart was more interesting than the mean pressure chart (fig. 39). There was a large plus 9 mb anomaly center near 53°N, 178°E. The trough over the Gulf of Alaska produced a minus 2 mb center. A large area of the subtropics west of 180° and between latitudes 20°N and 40°N was below normal pressure with a minus 6 mb center. The eastern subtropics were also slightly below normal.

There were major deviations from normal in the height of the 700 mb pressure surface. The Pacific High was near normal but there was an anomalous LOW over the Gulf of Alaska and another off the northern California coast. There was also an anomalous trough east of Japan. There was also an anomalous ridge over midocean along longitude 180°, north of latitude 40°N.

Tropical cyclones Alex, Betty, Cary, Dinah and Ed were over the western North Pacific this month, and Fausto, Genevieve, and Herman were over the eastern North Pacific.

Some climatology. On July 10, 1913 the mercury hit 134°F at Greenland Ranch in Death Valley, Calif. The hottest reading ever in North America. On July 30, 1965 the temperature hit 107°F at Portland Oregon to equal their all-time record.

Extratropical Cyclones -- The month began with a LOW over the Gulf of Alaska. A front stretched east-west across the midlatitudes from Kyushu to Washington. High pressure dominated the subtropic latitudes. Hurricanes Douglas and Elida were over the eastern ocean and tropical storm Alex was off northern Luzon. By midweek high pressure was over the midlatitudes with frontal waves along the weakening front. The last of the week the high pressure built with an average 1036 mb center south of the Alaska Peninsula (45°N.162°W).

The second week of HIGH built westward as another LOW formed over the Gulf of Alaska. At midweek there were several weak LOWs south of the high pressure. At the end of the week there were three HIGHs approximately along latitude 40°N.

The third week the eastern two-thirds of the ocean was dominated by high pressure while the western one-third had multiple small LOWs. By midweek another LOW had formed over the Gulf of Alaska. The ocean was dominated by high pressure except for the LOW over the Gulf of Alaska and three weak LOWs south and southeast of Japan. One was the remains of typhoon Cary. The last of the week a LOW formed in an inverted trough and developed into one of the few significant storms.

High pressure still dominated the eastern two-thirds of the ocean with a broad flat gradient over the southeastern one-third the fourth week. At the end of the week there were multiple centers wih another LOW south of the Alaska Peninsula. Typhoon Dinah and Ed were located in the flat gradient low-pressure area south and southeast of Japan. The end of the month found a large HIGH near 40°N,165°W with LOWs surrounding it.

This first storm formed over Manchuria on the 2nd. It was on of four frontal waves within a weak cyclone that stretched to Kamchatka. The MEKHANIK GORDIENKO east of Mys Lopatka had 35-kn winds and 12-ft waves. On the 3rd the LOW was centered over the Sea of Okhotsk. The BARBAROSSA (51°N,170°E) had 44-kn winds from the

southwest and 15-ft waves. The NEPTUNE AMBER (46°N, 158°E) had southerly 47-kn winds. The storm was 990 mb at 0000 on the 4th near 58°N,158°E. Three ships in the vicinity of 51°N,166°E reported southerly winds between 40- and 47-kn. The highest waves were 16 ft. On the 5th the circulation broke into multiple centers.

At many times during the month high winds and waves were found off the California coast as the pressure gradient between the Pacific High and a trough over California from the heat LOW over southern California intensified. The winds are from a northerly direction in the gale to strong gale category. The waves are near 20 ft. As an example the PRESIDENT MADISON (38°N,127°W) had 31 kn and 21-ft swells on the 10th. The PACIFIC TRADER (35°N,122°W) measured 43-kn winds from 330° on the 12th, the CHEVRON OREGON (42°N,125°W) measured 42-kn winds.

On the 14th there was an area of low pressure between two weak high-pressures areas to the east and west. On the 0000 chart of the 15th a weak LOW was analyzed near 50°N,150°W. At 0000 on the 16th the storm was near 56°N,145°W. The NEW SULU SEA (48°N,152°W) had 43-kn westerly winds at 0300. The WESTWARD VENTURE measured 40-kn southerly winds at 1200. The PORTLAND (56°N,141°W) had 20-ft swells at 1800 and 0000 on the 17th. The LOW disintegrated on the 19th.

On the 17th a cutoff LOW formed in the upper air near 40°N,175°E. The eastern two-thirds of the ocean was covered by a large 1035 mb surface HIGH except for a weakening LOW over the Gulf of Alaska. An inverted trough formed in the southwestern part of the surface HIGH and by the 18th a LOW could be analyzed (fig. 40). At 1800 the MEONIA (41°N,168°W) had only 18-kn 150° winds but she found 26-ft swells from 120°. At 0000 of the 19th it was 980 mb near 41°N,175°W.

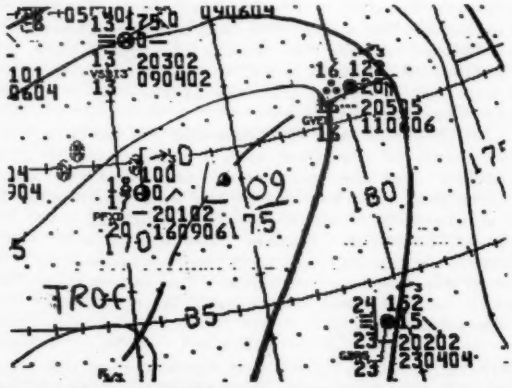


Figure 40.-- The 1200 surface chart of the 18th. Three ships around the new LOW helped identify its formation.

The CENTURY LEADER (39°N,161°E) on the northern side of the inverted trough reported 38-ft swells from 160°. Late on the 19th the MEONIA (42°N,178°W) had 38-kn north winds, 17-ft seas, and 30-ft swells, and the EHIME MARU (48°N,177°E) reported 28-ft swells. The TOYOFUJU (46°N,174°W) measured 43-kn east winds, 13-ft seas, and 17-ft swells. The swells increased to 20-ft on the 20th. The GLOBAL HIGHWAY (46°N,176°W) measured 46-kn north winds with 23-ft seas, and 26-ft swells.

On the 21st the storm was traveling northeastward and weakening. On the 22nd it turned eastward and was stationary near 54°N, 150°W on the 23rd and 24th and dissipated.

On the 23rd a cyclonic circulation was detected in the col area between two high- pressure cells near 45°N,166°E. What appeared to be insignificant weather reports from four ships helped indentify the circulation. Two reports were off-time reports. The weak system moved northeastward, then eastward around the HIGH. The storm did not develop until late on the 26th. By 0000 on the 27th it was 1001 mb near 52°N,158°W. The HAN WOO (54°N,156°W) measured 42-kn east winds. The OSHU MARU (51°N,148°W) measured only 12-kn west winds but the swell waves were 25 ft.

By the 28th the storm was weakening and there were no more reports of gale-force winds or high waves. It drifted eastward and dissipated on August 2.

Casualties -- Most of the casualties this month were collisions in fog. They started on the 1st with the collision of the AMERICAN NEW YORK and the STAR DOVER near Tokyo Bay. On the 5th the MORIKA MARU and EASTERN LAUREL collided in Harimanada passage. The SHINKO MARU No. 5 and KAKURYU MARU collided in the Inland Sea. The KUMI MARA No. 8 and NAM SUNG No.7 collided on the 14th also on the Inland Sea. The TAIYO MARU and NIKKO MARU collided off Hachinoke late in the month. The SUN ISLAND struck the breakwater while entering Kushiro on the 26th.

The dredger ILE AUX COUDRES sustained weather damage between the 7th and 9th. Other Casualties -- The MICHELLE C. arrived Bombay with weather damage. The SEALOGGER encountered heavy seas and swells on the 16th in the Indian Ocean near 12°N,52°E. The AL SABA developed water leakage in heavy weather enroute to Dubai with a cargo of 760 live goats. She was assisted by pumps and taken in tow by the AL SHABBIR but sank. The MORAN had weather damage between Durban and Cape Town.

These two vessels had weather damage off Australia. The ALLUNGA from Long Beach to Sydney encountered force 9 winds and weather damages on the 4th. The IRAN ESLAMI deviated to Fremantle due to engine damage and heavy weather.

Weather Log, August 1984 -- There was no favorite path for the cyclone tracks this month. They generally occurred north of latitude 35°N and west of longitude 160°W, except for a few over and south of southern Alaska and west of the United States and Canadian coast. The first week and last of the month the cyclones traced a generally easterly

path. Between the first week and the last of the month the paths were generally northeastward. This agreed with the climatology of the primary storm tracks. Two storms off the British Columbia coast tracked southward at first then turned northward closer to the coast. Most of the extratropical cyclones were weak as is expected during August.

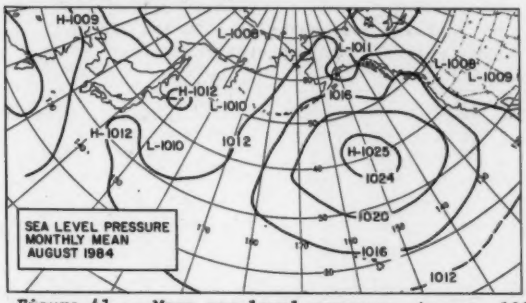


Figure 41.-- Mean sea-level pressure, August, 1984

The sea-level pressure pattern was dominated by the 1025 mb Pacific High near 40°N, 150°W (fig. 41). This was almost exactly its climatic position and only 1 ml higher in pressure. The High ridged into the Bering Sea more than normal. There was an anomalous weak 1011-mb LOW near Valdez, and two anomalous weak 1010-mb LOWs along longitude 160°E near latitudes 38°N and 51°N. The lowest pressure center for the area was 1008 mb over Siberia near 66°N, 150°E. There were two anomalous 1012-mb high pressure centers, one 300 mi southeast of Tokyo and the other about 300 mi east of the La Perouse Strait.

There were three significant anomaly pressure centers. A minus 3 mb center off Dixon Entrance and a minus 5 mb center near 39°N, 166°E. There was a double centered plus 4 mb area over the eastern Bering Sea.

The upper air at 700 mb differed considerably from the 30 year mean climatology. There was a trough east of the Asian coast that approximately paralleled longitude 160°E. The climatological trough west of the North American coast was sharper and deeper than normal and also extended farther north to near Yakutat, Alaska. As a result of these two troughs the ridge over the north-central ocean was sharper and extended farther north than normal. There was also slight ridging over Japan. The anomaly centers closely matched those at sea level.

There were five tropical cyclones over the western ocean tropical storms Freda, Gerald, and June, and typhoons Holly and Ike. The eastern ocean produced four tropical cyclones; tropical storms Julio and Kenna, and hurricanes Iselle and Lowell.

Some climatology: On August 26, 1883 the Krakatau volcano in the Sunda Strait of the East Indies exploded. The blast was heard 2,500 mi away and dust circled the Earth. It has been estimated that the average temperature dropped one degree for the next 2 yrs.

Extratropical Cyclones -- August started out with a large Pacific High. There was also high pressure across the western subtropics. Weak LOWs were confined to the north latitudes. There was a persistent LOW off British Columbia. At the end of the week the Pacific High was breaking down and a HIGH was over the midocean. Weak LOWs were off Vancouver Island and east of Honshu.

The second week the HIGH over midocean built and another HIGH moved over the Sea of Japan. LOWs formed between the high pressure cells. A weak LOW was over the south Alaska coast. At the end of the week a well-developed LOW was east of the Kurile Islands but weakened early in the third week.

The ocean east of Japan was generally under high pressure the third week. The only siginificant LOWs were tropical storms Gerald and Holly. At the end of this week high pressure persisted over the mid latitudes with several weak LOWs over the northern latitudes.

During the fourth week the Pacific High rebuilt with high pressure over the Sea of Okhotsk. A low pressure system with frontal waves extended from east of Honshu to the Aleutians. At midweek a frontal wave developed and became a larger LOW over Alaska. At the end of the week a LOW developing east of Honshu. The end of the month found high pressure over the Bering Sea connected by a ridge with the Pacific High. The was a LOW over the Gulf of Alaska and another east of Honshu and south of Kamchatka. There were four tropical cyclones over this ocean.

This was the persistent LOW off British Columbia meantioned earlier. It was on the first chart of the month. The EXXON PHILADELPHIA (55°N,139°W) measured 35-kn winds and 13-ft waves. There were no further gale reports until 1700 on the 4th when she reported 36-kn southeast winds and 15-ft waves. On the 7th the LOW was reinforced and the SOUTHERN CROSS (48°N,130°W) measured 42-kn woutheast winds and 12-ft waves. In the same area the TOKYO RAINBOW found 31-kn winds with 25-ft waves. At 1200 the PLAYA GIRON (50°N,128°W) measured 45-kn winds also from the southeast. On the 8th this LOW moved onto the coast and another approached from the west.

This cyclone was the extratropical continuation of typhoon Dinah. By August 2 she was extratropical near 44°N,177°W (fig. 42). The JAPAN RAINBOW measured 50-kn north winds at 46°N,179°E. The TOYOTA No. 24 had 47-kn west winds and 16-ft waves near 44°N,180°. On the 3rd the JAPAN RAINBOW measured 40-kn northwest winds with 20-ft waves in fog with a quarter mile visibility. The PACNOBLE (50°N,169°W) had 35-kn east winds with quarter mile visibility in fog on the 4th.

The storm was weakening and no more winds of gale force were reported. It survived on the charts until 1200 on the 7th.

Manchuria produced this storm. It was over the northern Sea of Japan on the 11th and strengthened as it crossed the Kuril Basin. The LARS MAERSK (44°N,148°E) measured 38-kn south winds. At 0000 on the 13th it was 982 mb near

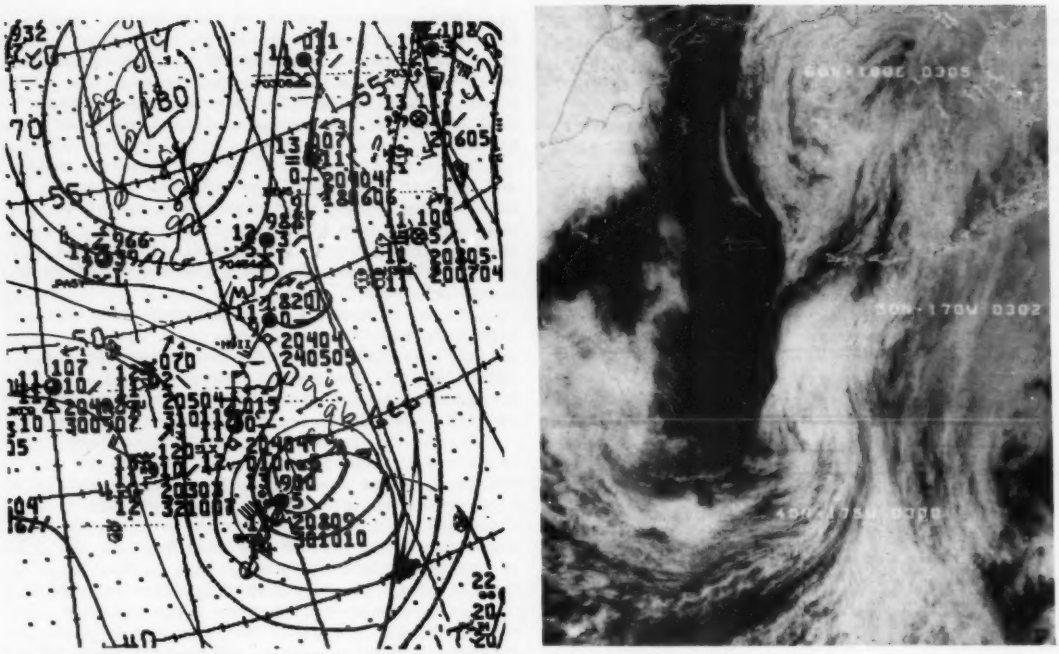


Figure 42.-- Extratropical Dinah was centered near 44°N, 178°W at 0000 on the 2nd. The satellite image was for 0300. Another storm was due north near 57°N. NOAA.

49°N,160°E. The PRESIDENT HOOVER (45°N,155°E) had 42-kn northwest winds.

The SEA-LAND INNOVATOR (42°N,155°E) measured 33-kn winds from the northwest with 20-ft waves. On the 14th the HYUNDAI (45°N,159°E) measured 40-kn north winds with 33-ft waves. The SKOUBARD (41°N,154°E) measured 27-kn winds but the seas were 20-ft.

The storm was weakening but the FRANCIS SINCERE (40°N,158°E) measured 360 degree 33-kn winds with 20-ft swells early on the 15th. The LOW was gone on the 17th.

A cyclonic circulation developed over the northeastern corner of Manchuria between two weak high-pressure cells on the 16th. The storm was near Mys Lopatka on the 18th. The HO-YU (48°N,156°E) claimed 54-kn southwest winds. The storm was 994 mb near 52°N,160°E at 0000 on the 19th. At 1200 the PRESIDENT PIERCE (48°N,169°W) had 35-kn winds out of the south. The PACIFIC SEAHORSE had 35-to-40 kn winds and 12-ft waves at 56°N,167°W. On the 20th the NEPTUNE AMBER (49°N,163°E) measured 48-kn northwest winds. At 1200 the NOAA ship CHAPMAN measured 35-kn northeast winds and 10-ft waves near 58°N,172°W.

Late on the 19th the circulation had split into two centers. By the 21st the new center to the northeast of the old center was primary. On the 22nd the KENWOOD (54°N, 157°W) had 26-ft seas. The ORIENTAL EXECUTIVE (54°N,154°W) measured 36-kn winds and the OCEAN CROWN (54°N,161°W) had 20-ft swells. At 1200 the storm was 994 mb inland of Cape Romanzof.

This frontal wave formed near 41°N,155°E on an old east-west front. Tropical storm Holly was over the Sea of Japan. On the 0000 chart of the 22nd observations from three ships and a buoy helped identify its formation. Wind direction and pressure were the most important meteorological elements. The storm moved east and then northeastward as a frontal wave until the 24th. Seemingly insignificant observations, by theirselves, by two or three ships helped track the frontal wave.

At 0000 on the 24th the wave was 990 mb near 51°N,173°W. The ORIENTAL EXECUTIVE (54°N,176°W) measured 50-kn winds from the northwest and 15-ft waves. The EVER SUPERB (47°N,166°W) sent an 0800 observation of 26-kn southerly winds, 23-ft seas, and 26-ft swells. Other ships had winds near 40-kn and waves near 17 ft. The NIKKO MARU (43°N,176°W) measured 30-kn winds, 12ft seas, and 25-ft swells. At 1200 the storm was 978 mb near 57°N,170°W. The PACIFIC SEAHORSE (56°N,167°W) reported 18-to 20-ft waves. The ARCTURES reported 50-to-60-kn winds during the night of 23rd & 24th to WBH 29, Kodiak.

On the 25th, the QUEEN OPAL (54°N,161°W) measured 44-kn southwest winds with 21-ft waves. The USCGC SWEETBRIAR (57°N,147°W) measured 38-kn winds from 220°, 10-ft seas at 6 sec, and 25-ft swells at 13 sec. By 1200 the storm was north of Anchorage (fig. 43). The MOBIL MERIDIAN (57°N,141°-) reported 48-kn west winds and 23-ft waves at 1200 on the 26th. the PHILADELPHIA (57°N,142°W) measured 38-kn winds with 33-ft swells. The LAURA reported 65-to-70-kn winds and 25-to-28-ft swell. The BESSIE M and

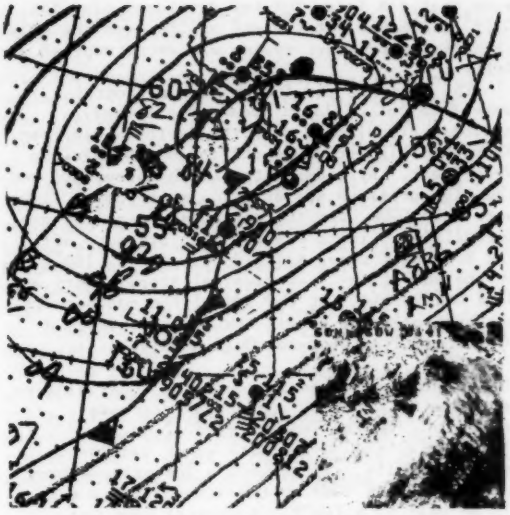


Figure 43.-- Surface chart 0000 August 25 with satellite inset. NOAA.

ANNIHILATOR (57°N, 146°W) both reported 80-to-90 kn winds and the latter 30-ft swells.

On the 27th the original LOW was over Canada but a secondary center had formed near Yakutat keeping the circulation over the Gulf of Alaska. The Philadelphia (58°N,143°W) measured 43-kn winds with 20-ft seas, and 33-ft swells. The SAMUEL S. (47°N,133°W) measured 28-kn winds from 350°, 17-ft seas, and 26-ft swells from 320°. This small LOW moved into the mountains and another took its place on the 28th. The SOHIO RESOLUTE (57°N,142°W) reported 30-kn west winds, 12-ft seas, and 23-ft swells. The OVERSEAS JUNEAU (53°N,135°W) had only 18-kn winds with 21-ft swells. By the 29th the storm was gone.

This storm was the extratropical continuation of typhoon Holly. Holly became extratropical over the Sea of Japan on the 22nd. There were gale reports on the 23rd as the storm moved east of Hakodate. The higher waves were 15 to 20 ft. As the storm moved southeastward, eastward and then northward on the 25th it reverted to a frontal wave.

On the 26th the LOW was 998 mb near 45°N, 180°. There were now gale-force winds again. The BUNGA MELAWIS (48°N,177°E) found 35-kn winds from 030° and 20-ft waves. The SACRAMENTO (40°N,179°W) slightly east of the front had 35-kn south winds and 18-ft waves. On the 27th the storm was 990 mb. The QUEEN OPAL (53°N,179°E) measured 45-kn winds and 20-ft seas. The storm was weakening on the 28th but early the STAR LUZON (53°N, 177°W) found 38-kn winds. The storm stalled over the Gulf of Alaska on the 30th.

On the 26th there was a large-flat HIGH over the western midlatitudes of the ocean last of Japan. The 0000 chart of the 27th indicated a LOW had formed over Honshu. The storm tracked eastward and on the 28th stalled near 40°N, 155°E at 984 mb. The HAKUSAN MARU (40°N, 153°E) measured 45-kn winds at 0300. The ORIENTAL EXECUTIVE (39°N, 145°E) measured 25-kn northwest winds with 20-ft swells. The WOENSDRECHT (41°N,154°E) reported 52-kn northeast winds and 15-ft seas. On the 29th, the VAN CONQUEROR (43°N,150°E) measured 42-kn winds from the northeast with 18-ft swells. The storm center dropped southward by the 30th. The WORLD PROBITY (46°N,152°E) measured 25-kn easterly winds, 13-ft seas, and 21-ft swells. The storm weakened on the 31st.

On Spetember 1 the storm started moving northward. the HYUNDAI No.21 (42°N, 158°E) had northerly 36-kn winds and 23-ft waves. The stor, never regained its strength and dissipated on the 4th.

Casualties -- The GINREI MARU capsized and sank in high seas off Lubang Island on the 8th. All of the crew were rescued. The MARINA DEL SUR with 16 crewmen sank on the 16th off Banos Point, Davao. The Sea Explorer training vessel S.E.S. PROPELLER sank on the 25th at Wrangell Narrows in southeast Alaska in heavy weather. She was blown onto a reef. All 24 aboard were safely evacuated.

The SEA ENTERPRISE had weather damage betwen the 24th and 27th. The GREAT ALASKAN broke moorings in a storm in Kodiak harbor. She contacted the EXCELLER and SMOKWA SHELL and grounded on a breakwater.

The BLUE FALCON had weather damage from hurricane LOWELL on the 28th southwest of Baja California. The winds were reported as 65 kn and the waves 15 ft. All 23 crew members were rescued by the JOSEF ROTH.

Other Casualties -- The EMBARCADERO and CAPTAIN JOHN D. PATERAS contacted in high winds at Chittagong on August 1. The NEW ZEALAND STAR had weather damage enroute from Melbourne to Fremantle between the 1st and 5th. The ORIENTAL PEARL arrived Bombay on the 7th with weather damage. The KIRYO MARU No. 1 wrecked off ROTTNEST on the 6th when her propeller shaft broke in rough seas.

The OCEAN TUNA had weather damage out of Bombay and diverted to Mormugao. The CHAR YE sank south of Socotra Island on the 10th in rough seas. Seven crewmen survived. The MARY HOLYMAN had rudder damage in rough seas off Tasmania on the 13th

The Jerry JILANI sank in a storm in the Bay of Bengal on the 18th. About 100 passengers were missing and about 150 were rescued.

WEATHER LOG, SEPTEMBER 1984 -- There was no distinct storm track this month. Especially north of latitude 50°N the storms circled and wandered over the Bering Sea and Gulf of Alaska. There were quiet a few cyclones over the Gulf of Alaska but they were generally weak. The next most congested area was north of the Aleutian Islands.

The monthly mean sea-level pressure chart showed the Aleutian Low with two 1004 mb centers, one over the central east coast of Kamchatka and the other near 55°N,177°W (fig. 44). The Pacific High had a 1021 mb center near 35°N, 160°W and a 1020 mb center near

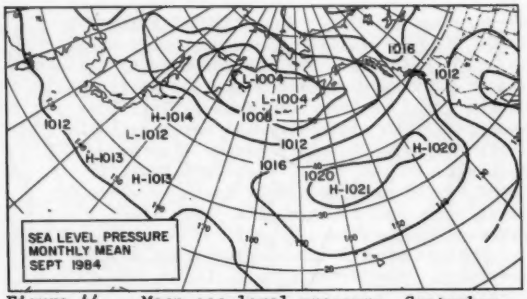


Figure 44.-- Mean sea-level pressure, September, 1984.

37°N,138°W. These two centers straddled the 1021 mb climatic center. There were three weak high pressure centers and one weak low pressure center east of Japan. There was an anomalous 1020 mb High over Banks Island of northern Canada.

The sea-level pressure departure from normal chart showed several significant anomaly centers. The negative ones were, a 7mb over Kamchatka, a 4mb near 30°N,168°E, a 4 mb east of Salt Lake, and a 3 mb near 53°N,140°W. The significant positive anomaly center was 7 mb over the northeast corner of Banks Island.

The monthly mean upper air flow at 700 mb was mainly zonal between latitudes 40° and 50°N. The long-wave trough was shifted from the climatic position of longitude 170°W to 160°E. There was an anomalous east-west trough along latitude 55°N between the eastern Bering Sea and the Canadian coast. The climatological ridge over the Canadian Rocky Mountains was highly accentuated into the Beaufort Sea. The subtropical ridge was stronger than normal over the midocean.

There were four tropical cyclones over the Western North Pacific; typhoon Kelly and tropical storms Lynn, Maury and Nina. Over the eastern North Pacific there were four tropical cyclones all hurricanes; Marie, Norbert, Odile, and Polo.

Extratropical Cyclones -- A summary of the month's activity. The month started with the Pacific High near 45°N,165°W with LOWs over the Gulf of Alaska and east of Kamchatka. There also was a weak HIGH near 25°N,140°E. The Pacific High moved southward and weakened. The Gulf of Alaska LOW remained stationary and deepened. The western LOW moved northward. By the end of the week the Gulf of Alaska LOW dissipated, the Pacific High was moving northeastward, and the western LOW looped and turned eastward.

The second week found high pressure along the 35° to 45° N latitude band. There were no significant pressure systems. At midweek high pressure dominated the water area except for the northwest gradient. By the end of the week the midocean HIGH was moving southward. There were two LOWs over the northern latitudes between 50° and 55°N. A tropical LOW over the south-central ocean became Kelly.

The third week the high pressure systems were weak. A large LOW had developed over the Gulf of Alaska. At the end of the week the only significant pressure system was extratropical Kelly.

The first of the fourth week a frontal wave from out of Japan became the primary cyclonic circulation over the northern midocean. There was high pressure off the North American West Coast. By midweek the LOW had deepened and the high pressure was drifting southward. There were weak LOWs over the northwest ocean and one intensified. There was now high pressure off the U.S. West Coast and midocean (35°N, 180°). At the end of the week tropical storms Maury and Nina had formed. At the end of the month there was high pressure across the midlatitudes. A LOW intensified over the Gulf of Alaska.

This frontal wave was present near 40°N,161°E on September 1. The LOW center was tracking northward. On the 2nd the HYUNDAI No.21 (42°N,158°E) had 36-kn north winds and 23- ft seas and swells. There were a few gale reports on the 3rd. At 0000 on the 4th the storm was 976 mb near 53°N,164°E. A frontal wave was moving around the southern circumference of the storm. By the 5th this frontal wave had become the primary circulation.

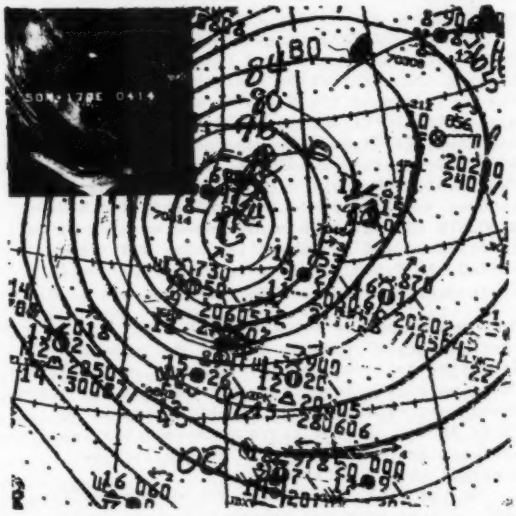


Figure 45.-- Surface chart 0000 September 6 and 0414 satellite image. NOAA.

On the 5th and 6th the center moved in a counter-clockwise loop centered on about 53°N,180° (fig. 45). On the 5th the SAMUEL S. measured 28-kn west winds with 13-ft seas, and 28ft swells near 42°N,175°E. The SUZAKAZE MARU (58°N, 179°E) measured 42-kn east winds with 17-ft seas, and 26-ft swells. The SAMUEL S. still had 26-ft swells on the 6th. The SANWA MARU (48°N,171°E) had 46-kn northwest winds and 21-ft waves. By 0000 on the 7th the 976 mb storm was near Adak Island. A ship near 49°N,171°W had 20-ft swells.

The storm was weakening on the 8th. It

turned southeastward and died on the coast on the 11th.

This low formed on the 10th at the point of occlusion of a frontal system that developed over the Sea of Japan. The YOUNG SPLENDOR (40°N,156°E) had 36-kn southeast winds north and east of the warm front. The waves were 15-ft. On the 11th the NEPTUNE DIAMOND (47°N,156°E) had 44-kn southeast winds and 20-ft swells. The storm had been tracking northeastward but it turned eastward on the 12th. The SEA-LAND FREEDOM (50°N,169°E) measured only 22-kn southwest winds and 8-ft seas, but the swell was 25ft. The storm was 986 mb near 54°N,157°E. The PRESIDENT JEFFERSON (49°N,164°E) had 45-kn southerly winds. On the 13th the OSHU MARU (50°N,165°E) measured 26-kn winds, 10-ft seas, and 26-ft swells. The JAPAN ALLIANCE (52°N,175°E) measured 58-kn west winds. Two ships in the same general area on the 14th reported 60-kn winds. The storm was absorbed by another LOW over the Gulf of Alaska late on the 14th.

The cyclonic circulation generated between three high pressure cells produced this cyclone on the 11th. On the 12th the SHIN-KASHI MARU (44°N,161°W) had 38-kn northwest winds. On the 13th the HANJIN INCHEON (50°N,149°W) measured 37-kn east winds, 21-ft seas, and 25-ft swells. The OVERSEAS JUNEAU (57°N,141°W) had 50-kn east winds, 13-ft seas, and 26-ft swells on the 14th. The following fishing vessels sent in reports of winds 45 to 55 kn and waves up to 25 ft to WBH-29 Kodiak: DAPHNE, STACY FOSS, BULFIN and RAVEN.

The storm did a quick loop on the 15th as it absorbed the previously described storm late on the 14th. At 0000 on the 16th the storm was 982 mb near 55°N,150°W. There were some gale reports in the southern semicircle. The storm died on the 18th as it moved toward the Alaska panhandle.

This storm was extratropical extension of typhoon Kelly. Kelly was extratropical by 1200 on the 18th near 39°N,174°E. The SILVER ACE (38°N,176°E) was sailing west toward his center with 40-kn south winds. The barometer read 992.8 mb. At 0000 on the 19th the storm was 984 mb near 43°N,178°W. The MUTSU MARU (47°N,176°W) measured 48-kn winds and 28-ft waves. The NEW INDEPENDENCE (46°N,175°W) measured 40-kn northeast winds and 20-ft waves which continued into the 20th. The QUEENS WAY BRIDGE (39°N, 172°W) measured 47-kn west winds, 20-ft seas and 33-ft swells. The JGPG (52°N, 168°W) measured 58-kn northeast winds, 23- ft seas, and 39-ft swells. On the 21st the high winds were only gales but at least four ships reported waves higher than 24-ft. The storm was weakening on the 22nd but the PHILADELPHIA reported 25-ft swells near 54°N,136°W. The storm disappeared over the Bering Sea on the 23rd.

A frontal wave formed just east of Tokyo on the 19th. On the 21st a ship near the center of the LOW reported 40-kn winds. At 0000 on the 22nd the 986 mb LOW was near 44°N,168°E. The PRESIDENT PIERCE (43°N,172°E) had 38-kn south winds east of the occlusion. The TAMA MARU (44°N,166°E) west of the center had 45-kn northwest winds and 16-ft waves. On the 23rd three ships reported winds above 50-kn in the vicinity of 47°N, 175°E. The highest waves were 21 ft. They were the CANADIAN ACE, ORIENTAL SOVEREIGN, and VAN CONQUEROR. Another ship near 44°N, 173°W had light winds but the swells were 30 ft. The NORTON BAY on Bristol Bay reported southerly 50-to-70-kn winds and the ALPHA HELIX near Dutch Harbor had 35-to-50-kn southeast winds. The storm was 976 mb near 55°N177°W at 0000 on the 24th (fig. 46). The ZENO (43°N,175°W) had only 20-kn winds but 33-ft swells. A ship near 50°N,171°W had 50-kn southwest winds on the 25th. The STRATHCONON (54°N,175°W) reported 41-kn southwest winds with 20-ft seas. The storm disappeared by the 26th.

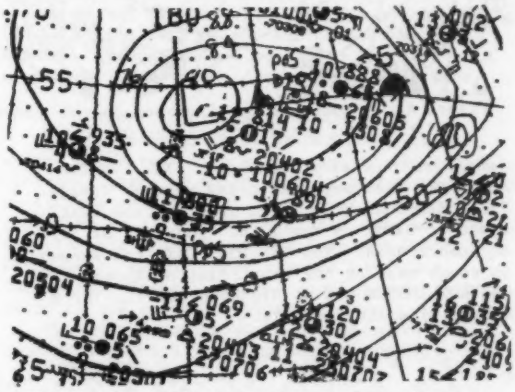


Figure 46.— 0000 September surface chart.

The last storm of the month formed as a frontal wave on the 27th in the area of primary frontogenesis east of Japan. The 1200 observations from the SOUTHERN HIGHWAY and JDMC help identify its formation. The LOW traveled northeastward and started to intensify on the 29th. At 0000 on the 30th the storm was 984 mb near 51°N,163°W. Far to the southwest of the center the CHARLOTTE LYKES (40°N,173°E) found 31-ft swells. The PRESIDENT JEFFERSON (43°N,169°W) found 50-kn west winds, 8-ft seas and 20-ft swells. The fishing vessels MARS (59°N,143°W) and DAPHNE (60°N,148°W) both found winds up to 50-kn and the former had 20-ft seas.

The fishing vessels CURLEW sent a Mayday and sank near the Shumagin Islands with only one survivor of a crew of four. It was in the area of the storm but there was no mention of weather. On October 1, the storm was 970 mb near Kodiak Island (fig. 47). The SEA-LAND INNOVATOR (53°N,148°W) found 40-kn southerly winds and 25-ft waves. The storm quickly weakened on the 2nd and dissappeared over Alaska.

Casualties -- the HOKUYU MARU No. 82 and the TORA MARU No. 52 collided in fog near Japan. the former sank but all 17 crewmen were rescued. The SEA ENTERPRISE reported heavy weather

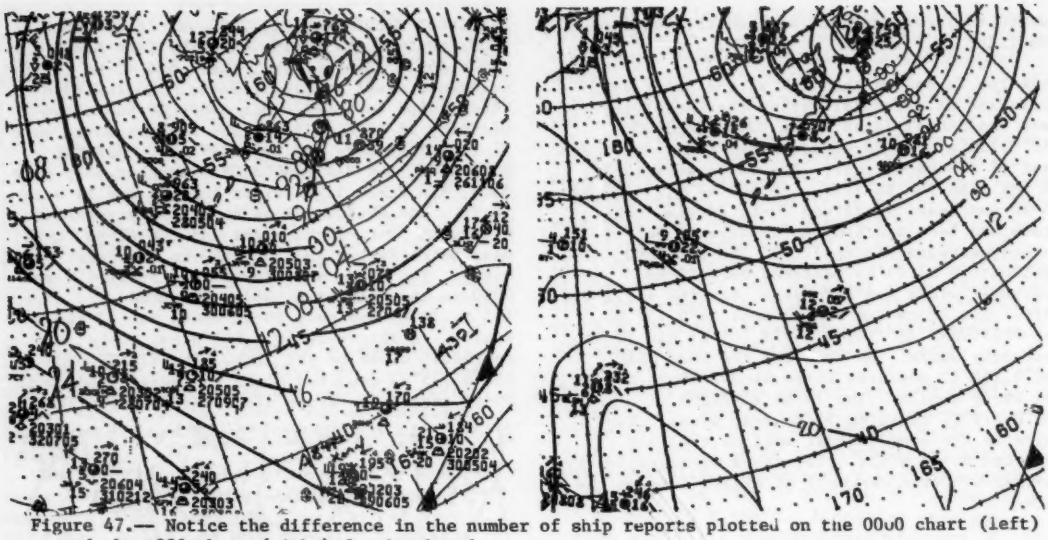
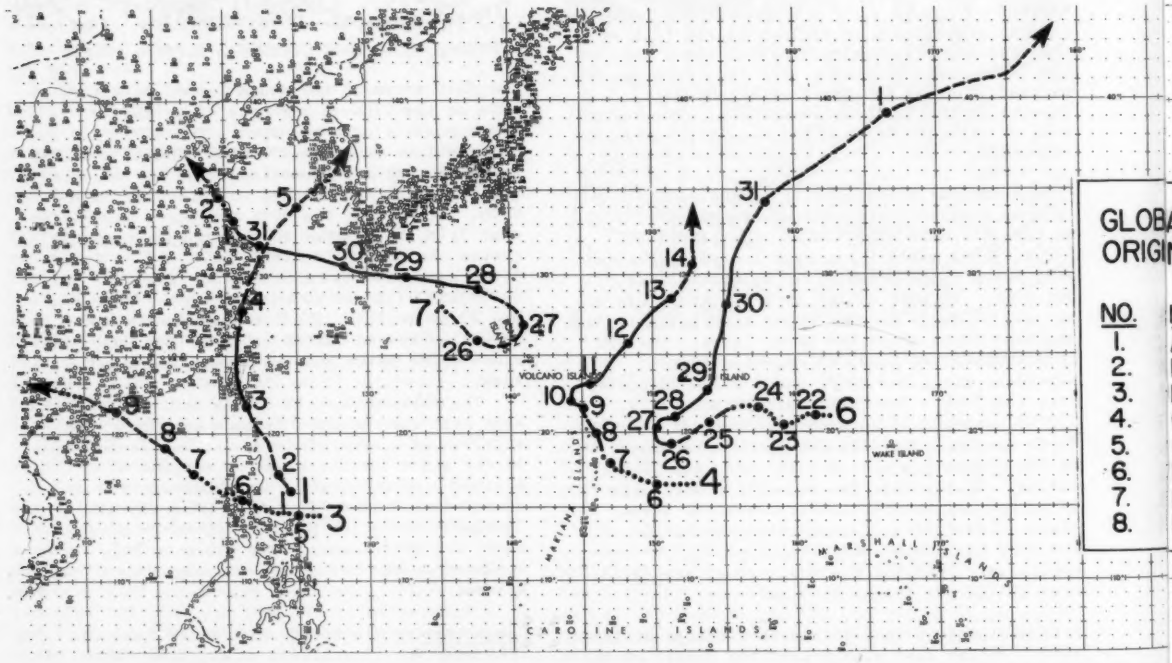


Figure 47.— Notice the difference in the number of ship reports plotted on the 0000 chart (left) and the 1200 chart (right) for October 1.

damage on arrival at Yokohama. The IGNACIO AGRAMONTE also reported heavy weather damage. The ROSARIO sank in rough seas off the west coast of Samar on the 27th. Fourteen of 37 occupants died. The TAE DONG GANG ran aground in rough seas on the west coast of Korea. The CHEVRON LONDON was at Richmond, Calif. for a survey of weather damage.

Other Casualties — the ANKIFY capsized off Madagascar on the 24th in rough seas and sank. At least 32 passengers died. The MARINIA encountered heavy weather on the 5th in the Arabian Sea. Later a crack was found in the hull and the crew abandoned ship on the 9th to the KRITI SAMARIA.



Figu

Hurricane Alley

Dick DeAngelis
National Oceanographic Data Center
Washington, D.C.

The tropical cyclone tracks (fig. 48) and the summaries are based upon information provided by Ted Tsui of the Naval Environmental Prediction Research Facility, Emil Gunther on the Eastern North Pacific Hurricane Center and Gil Clark and Miles Lawrence of the National Hurricane Center. Table 6 lists tropical cyclones that have developed so far in 1985. Details on the North Atlantic Hurricanes can be found on page 1.

TROPICAL CYCLONES--JULY 1984

As usual activity this month was spread across the entire North Pacific Ocean. While the eight tropical cyclones that developed is slightly below the average of nine, six of these reached hurricane or typhoon strength. Five of the tropical cyclones came to life in western waters; four of these became typhoons. In the eastern Pacific two of the three storms reached hurricane strength. In addition there was a tropical depression that did not attain tropical storm strength and therefore was not counted. All depressions in the west developed into tropical storms.

The first week was very active as Alex, Fausto, Betty, Gary, and Genevieve were all on the chart. Two hurricanes affected Baja, California within one week of each other -- Fausto and Genevieve. Things were quiet from the 14th through the 21st. Then typhoons Dinah and Ed came to life in the west. Ed created some problems for shipping. On the 29th the ILSHIN GLORY sank in Tsushima Strait in about 120m of water in stormy seas generated by Ed. Five crewmen were rescued, one found dead and 11 others were missing. Elsewhere the container vessel GLORIA EXPRESS, Keelung for Tokyo, was driven aground near Iojima on the 30th. One crewmember was lost trying to reach shore with his shipmates. The other 21 crewmen were rescued.

Dinah was the strongest of this month's storms as her maximum winds reached an estimated 125 kn of the 29th as she approached Marcus Island. Typhoon Ed and hurricane Geneieve both generated 100-kn winds during their lifetimes.

TROPICAL CYCLONES--AUGUST 1984

August is usually the second most active month of the year with an average of 12 tropical cyclones, seven of which usually become hurricanes or typhoons. This year was no exception as 15 tropical cyclones came to life from the mid Atlantic westward to the South China Sea: six of tnese reached hurricane intensity. Several storms caused damage to both shipping and coastal regions.

The most damaging storm of the month was typhoon Ike which moved through the Philippines

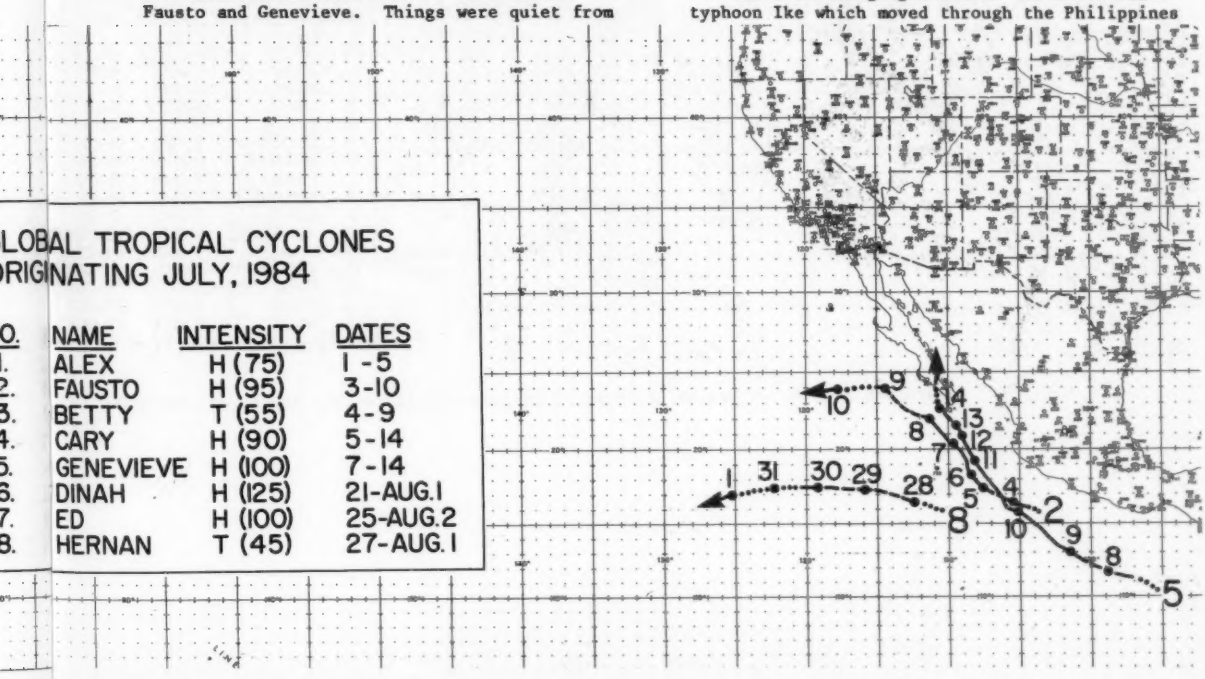
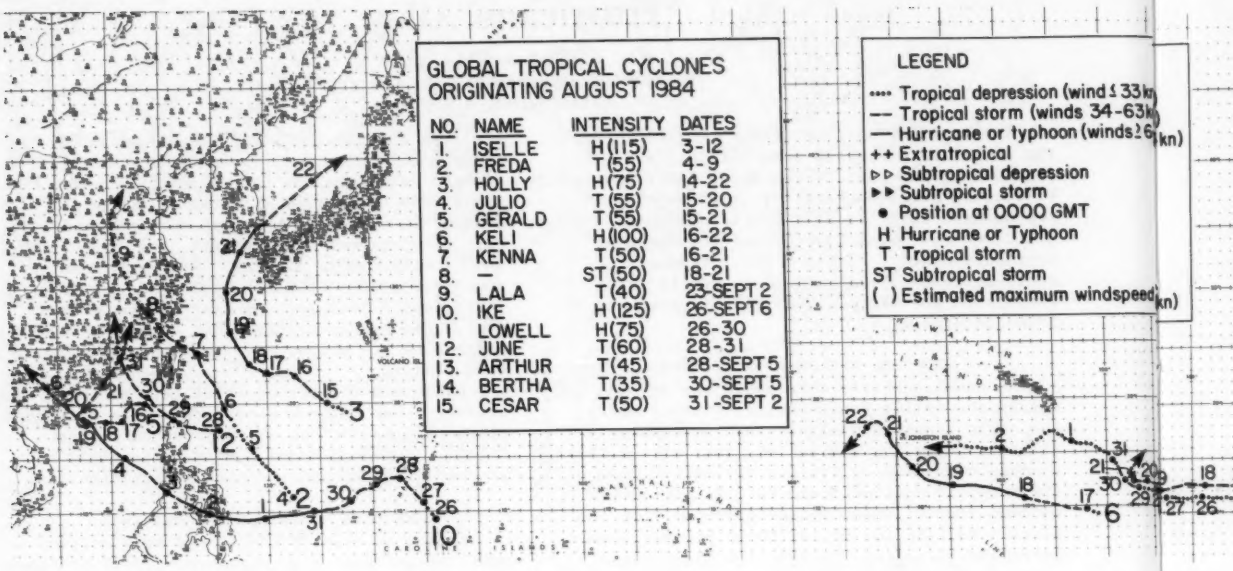

LOBAL TROPICAL CYCLONES
RIGINATING JULY, 1984
O. NAME INTENSITY DATES
1. ALEX H (75) 1-5
2. FAUSTO H (95) 3-10
3. BETTY T (55) 4-9
4. CARY H (90) 5-14
5. GENEVIEVE H (100) 7-14
6. DINAH H (125) 21-AUG.1
7. ED H (100) 25-AUG.2
8. HERNAN T (45) 27-AUG.1

Figure 48a.— Tracks of tropical cyclones July 1984.



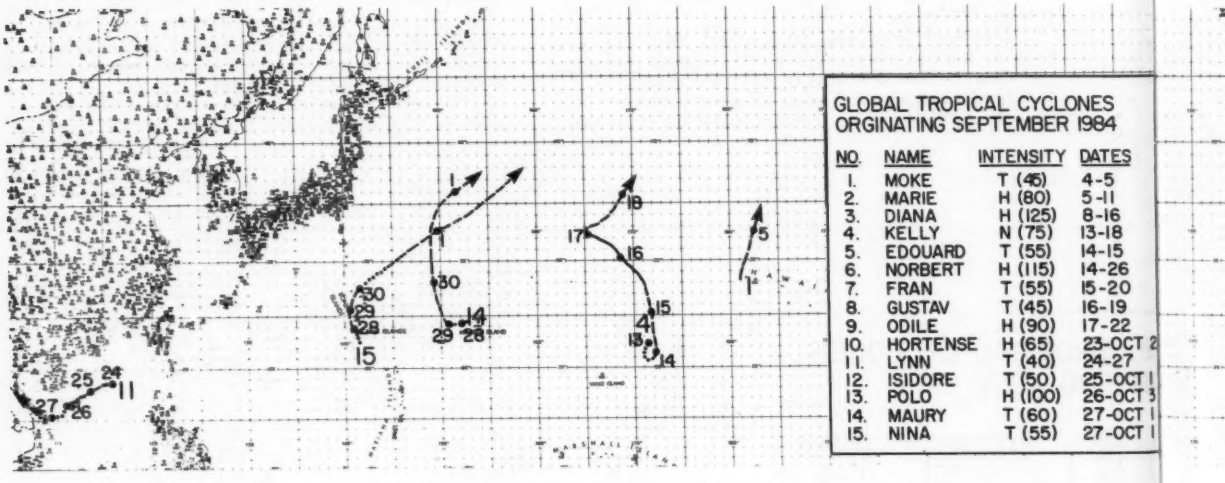
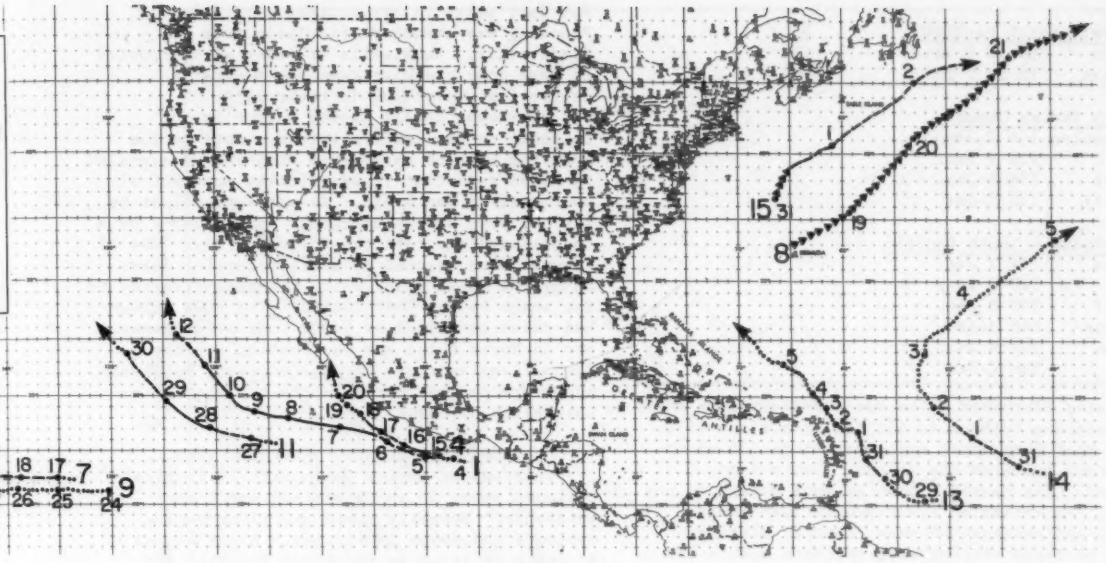

GLOBAL TROPICAL CYCLONES
ORGINATING SEPTEMBER 1984
NO. NAME INTENSITY DATES
1. MOKE T (45) 4-5
2. MARIE H (80) 5-11
3. DIANA H (125) 8-16
4. KELLY N (75) 13-18
5. EDOUARD T (55) 14-15
6. NORBERT H (115) 14-26
7. FRAN T (55) 15-20
8. GUSTAV T (45) 16-19
9. ODILE H (90) 17-22
10. HORTENSE H (65) 23-OCT 2
11. LYNN T (40) 24-27
12. ISIDORE T (50) 25-OCT 1
13. POLO H (100) 26-OCT 3
14. MAURY T (60) 27-OCT 1
15. NINA T (55) 27-OCT 1

Figure 48b and 48c.— Tracks of tropical cyclones Worldwide for August and September.



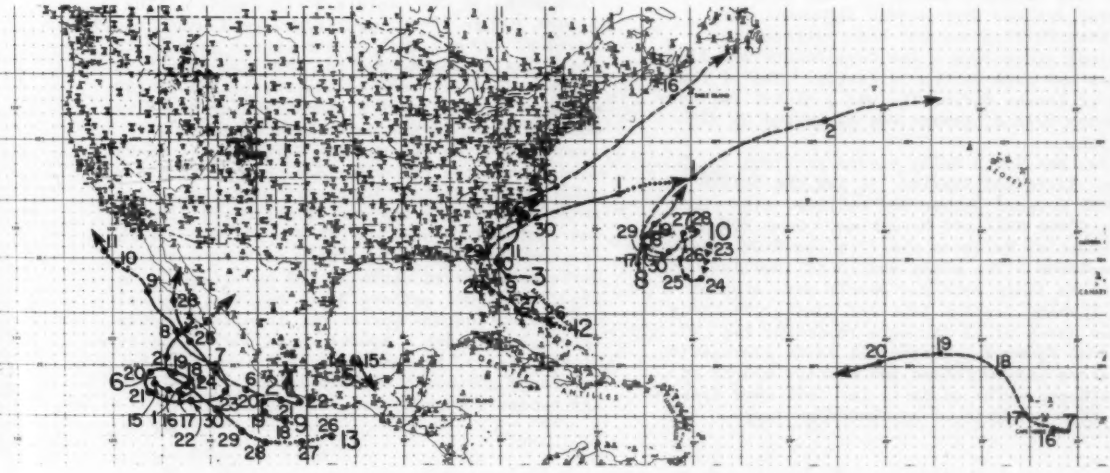


Table 6.--Tropical cyclone watch, 1985

Western North Pacific	
Elsie	TD 1W T Jan.
Fabian	TD 2W T Jan.

South Indian Ocean	
Celestina	10S T Jan.
--	12S T Jan.
Ditra	15S H Jan.
Gertie	17S T Jan.

Australia - South Pacific	
Drena	9P T Jan.
Eric	11P H Jan.
Nigel	13P H Jan.
Odette	14P H Jan.
Freda	16P H Jan.
--	18P T Feb.

in early September. Ike was considered the most devastating typhoon to hit the area since 1970. That year four super typhoons (winds 130 kn or greater) battered the islands over a 2-mo. period. Ike caused almost as much damage in one pass. An estimated 1,439 people lost their lives and another 560 were reported missing. Many of these victims were children unable to swim. More than one million people lost either their homes or their source of livelihood. In Cebu City harbor a number of tugs sank and several vessels were driven aground. The northern Philippines had been battered by tropical storm June a few days before and 57 people had died in that disaster. One of the biggest losses during Ike was a nickel refinery on Nonoe Island; damage was estimated at $19 million.

Farther north Holly caused problems in Japan, Korea and Russia. At sea the SATURN DIAMOND dragged anchor and collided with the ferry GINGA MARU off Hiroshima. Some 200 mi. northeast of Holly on the 17th the NACHI MARU encountered 55 kn winds and 23 ft. swells. Closer to shore some six people were missing from fishing vessels lost off Korea. On Cheju Island waves of 15 ft. were reported; two childred drowned. Torrential rains averaged 6 in. along the sourthern and eastern coasts of South Korea while up to 11 in. fell over Kyushu and other sections of southwestern Japan. Holly's influence even extended to the Soviet Far East where rivers reached record levels. Flooding was common particularly near Vladivostok. Hugh walls of water were reported to have come crashing down the mountains destroying everything in their path.

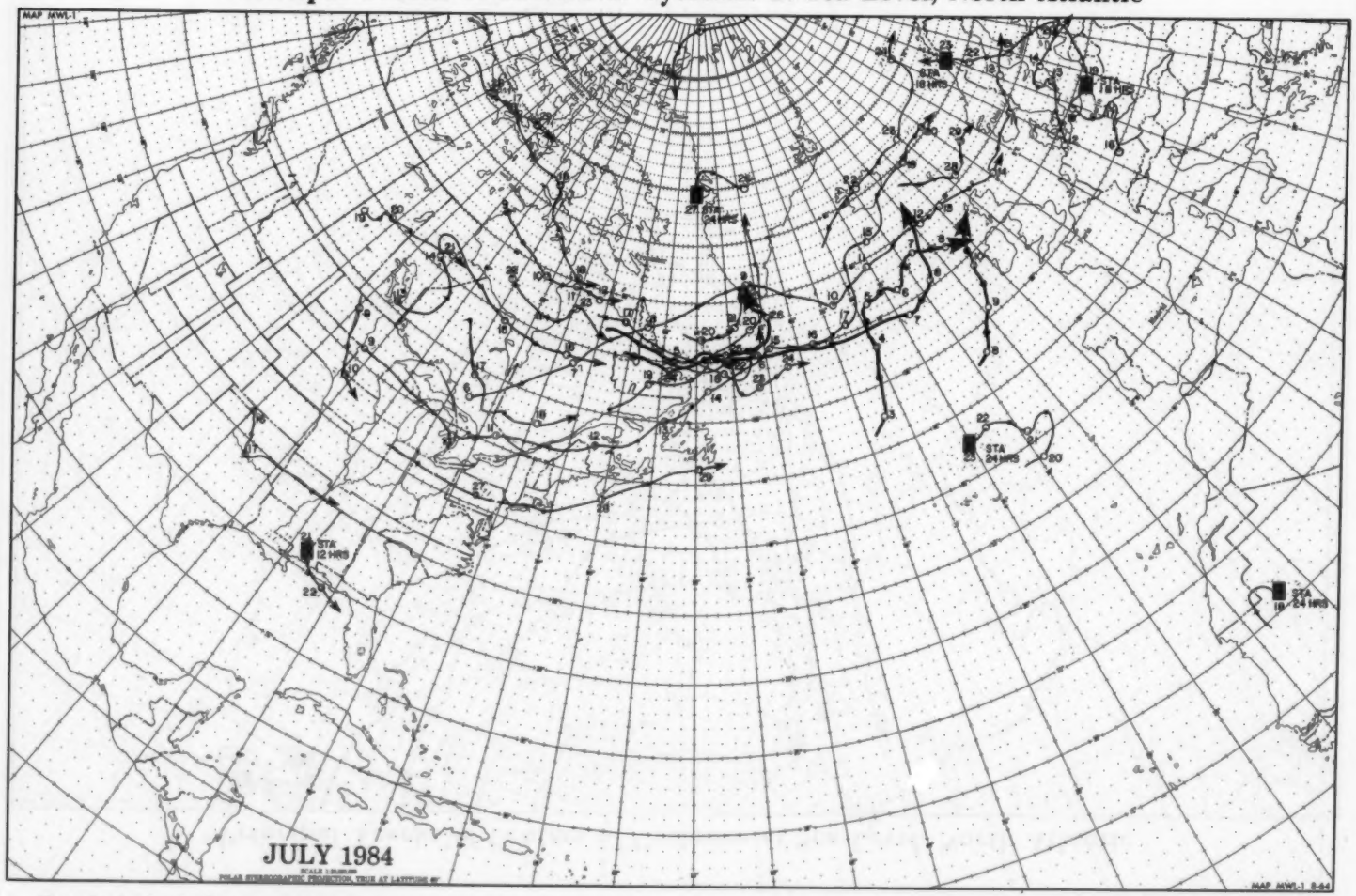
Hurricane Lowell caused a problem to shipping in the eastern waters. Late on the 27th the Cypriot cargo ship BLUE FALCON signaled in Morse code that it was sinking some 900 mi. southwest of San Diego. It was kept afloat by its own pump and an emergency pump dropped by a Coast Guard aircraft the following day. The 23 crewmen were rescued by another Cypriot cargo ship, the JOSEF ROTH, which had been diverted to the scene by the Coast Guard. The BLUE FALCON had taken on a load of 5,000 tons of maganese ore in North Korea and was heading for the Panama Canal enroute to Puerto Ordaz, Venezuela. A salvage tug was hired to tow the vessel to Long Beach harbor.

TROPICAL CYCLONES--SEPTEMBER 1984

This was an active month with 15 tropical cyclones seven of which reached hurricane intensity. Normally there are 12 tropical cyclones and seven hurricanes. Above normal activity occurred in the North Atlantic and Eastern North Pacific.

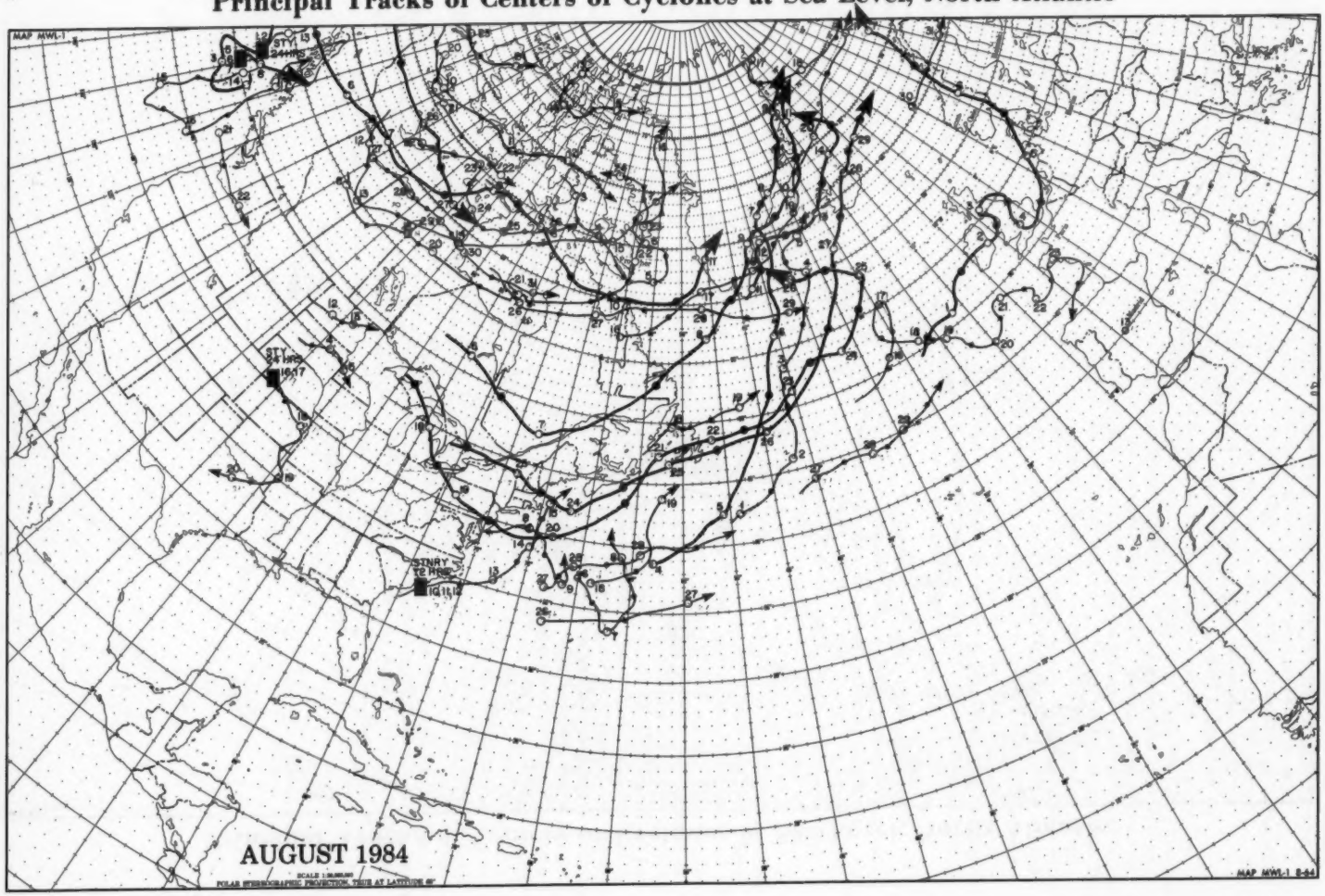
Hurricane Marie attracted alot of attention from ships in the eastern North Pacific. The SILVER ACE in 12-ft. swells measured winds of 49 kn about 100 mi. east of her center late on the 5th. The following day the PEND got caught in heavy rain which lovered the visibility to 200 yd. in 15-ft. seas with winds howling at 54 kn; she was about 90-mi. northeast of Marie's center. On the 7th the SUN RIVER caught 66-kn winds while the following day the SILVER ACE ran into 30-ft. swells. Like most of the activity this month in the eastern waters Marie's track was confined to east of 120°W. All four storms reached hurricane intensity. Both Polo and Norbert generated winds of 100 kn or more. In the central and western North Pacific tropical cyclone action was spread out from near Midway Island to Vietnam. However just one of the five storms, Kelly, reached typhoon intensity. Kelly developed northeast of Wake Island on the 13th and became a typhoon late on the 15th.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

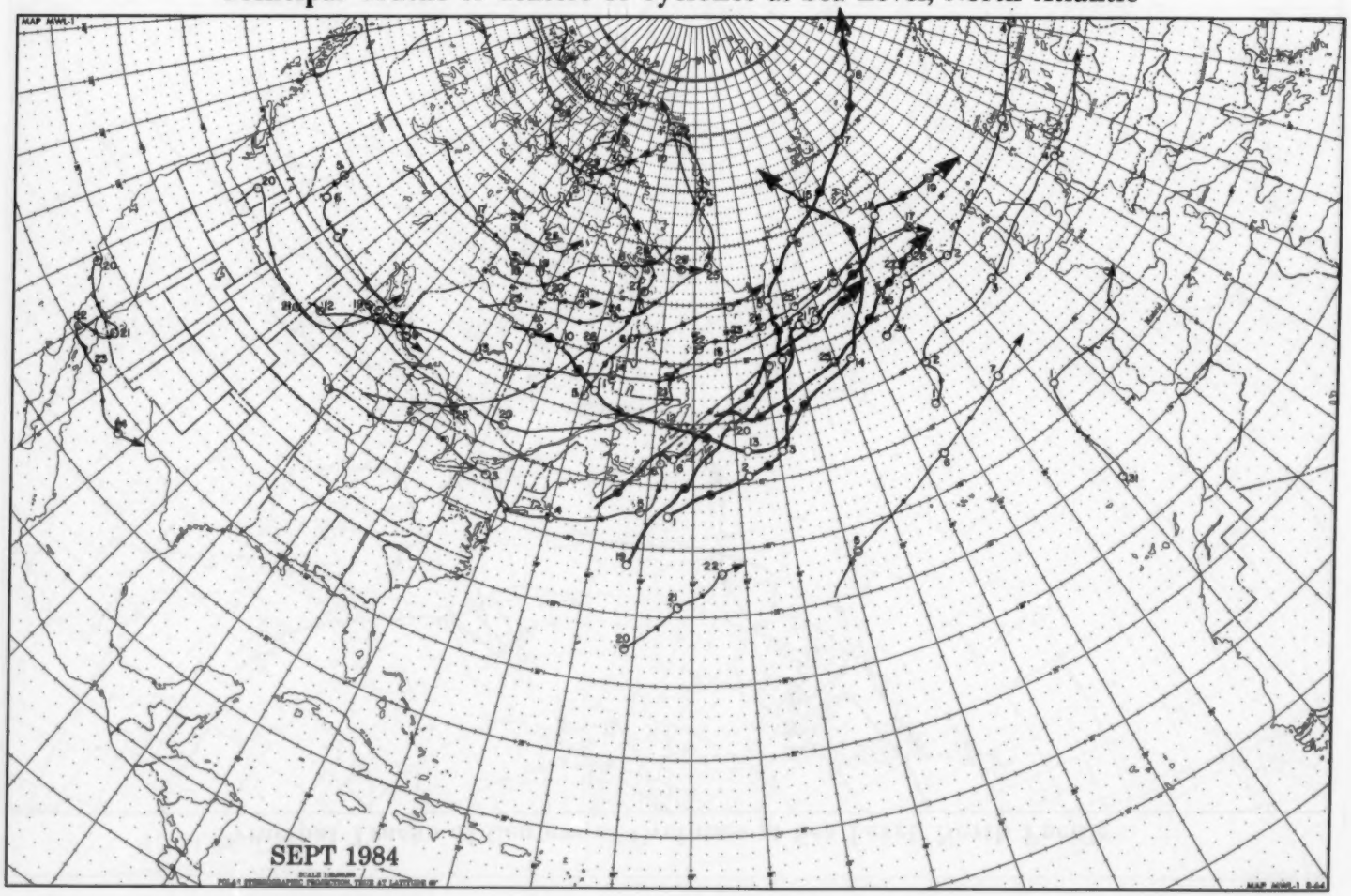
Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

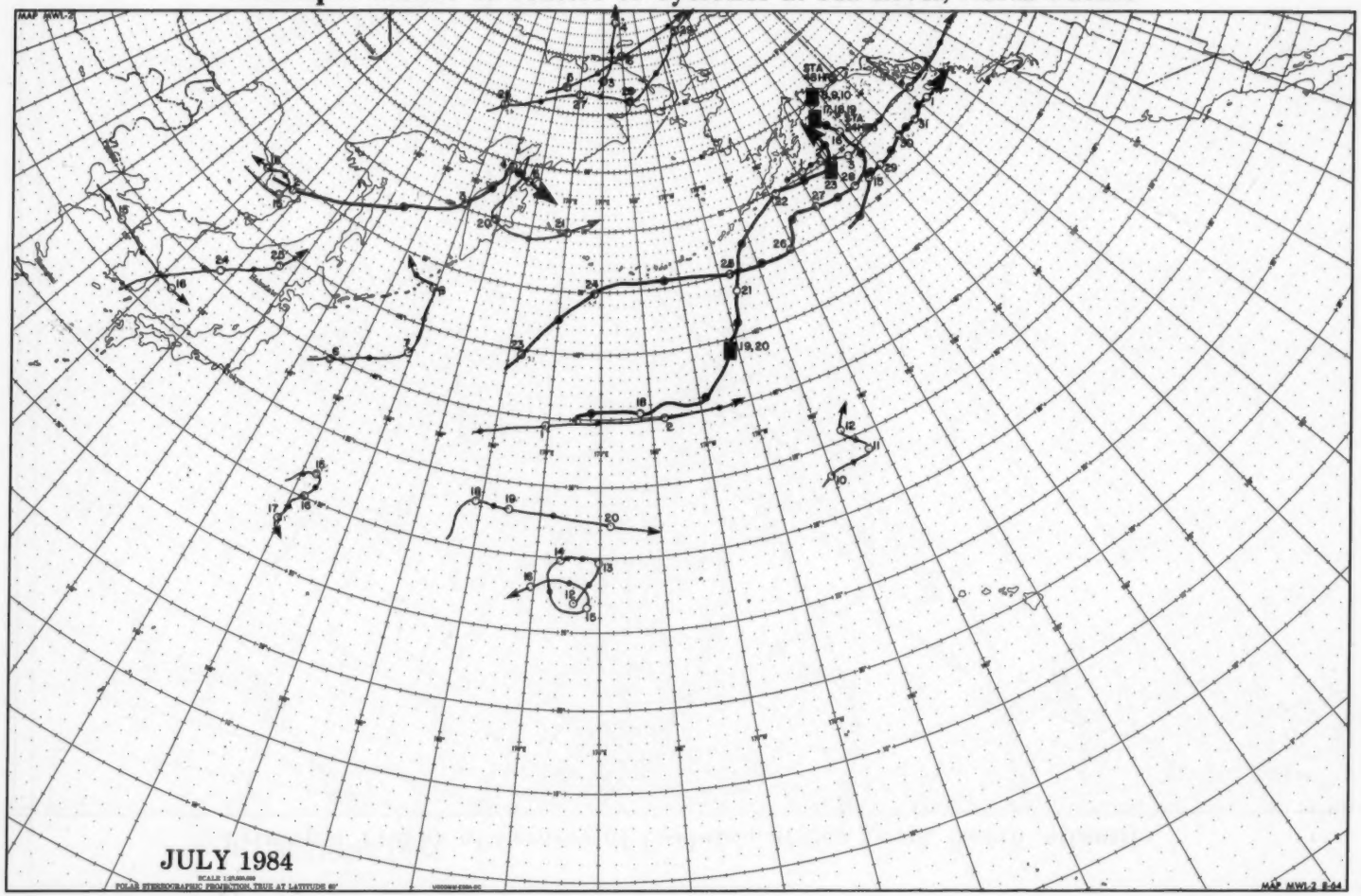
heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Atlantic



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

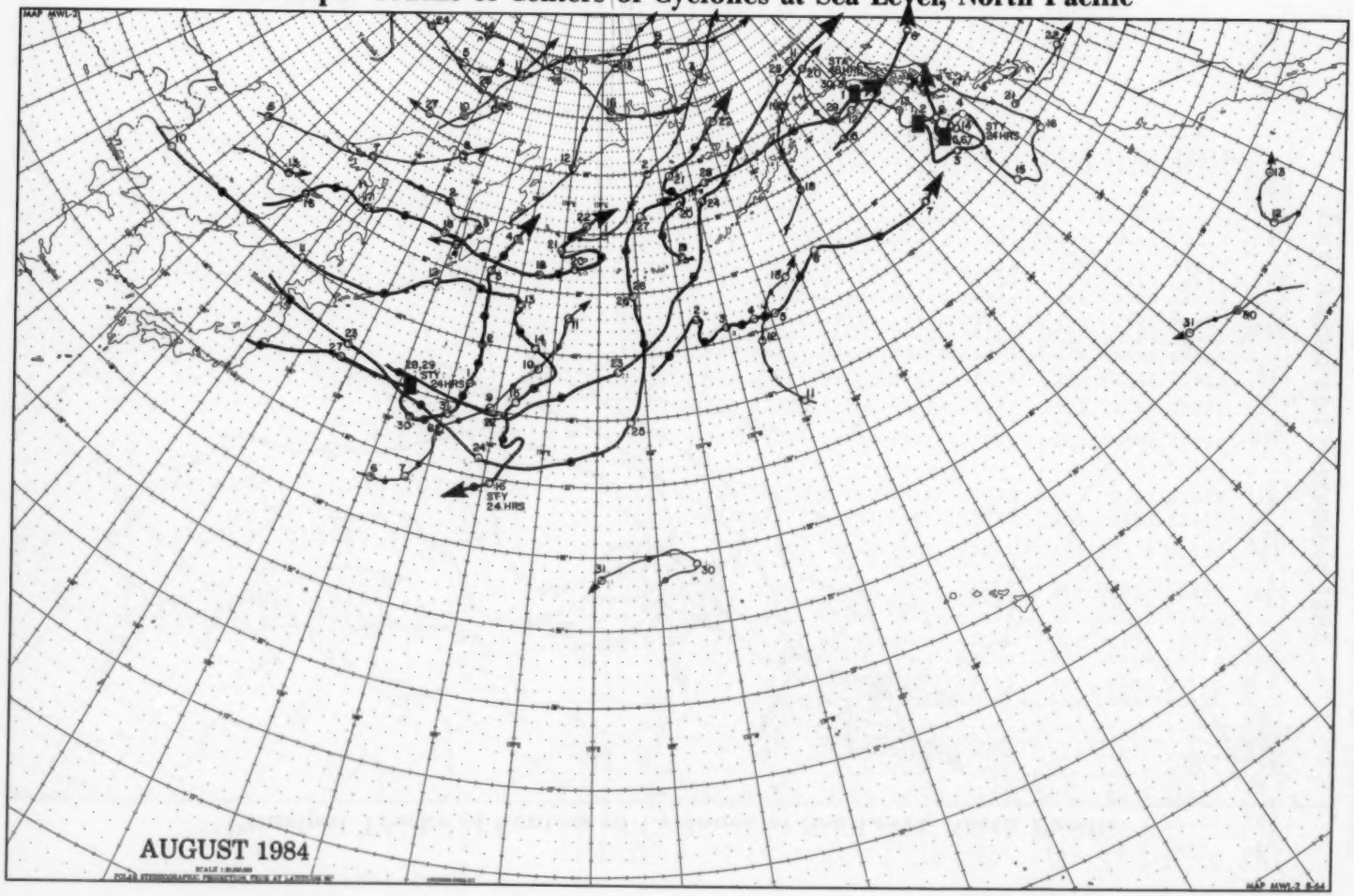
Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

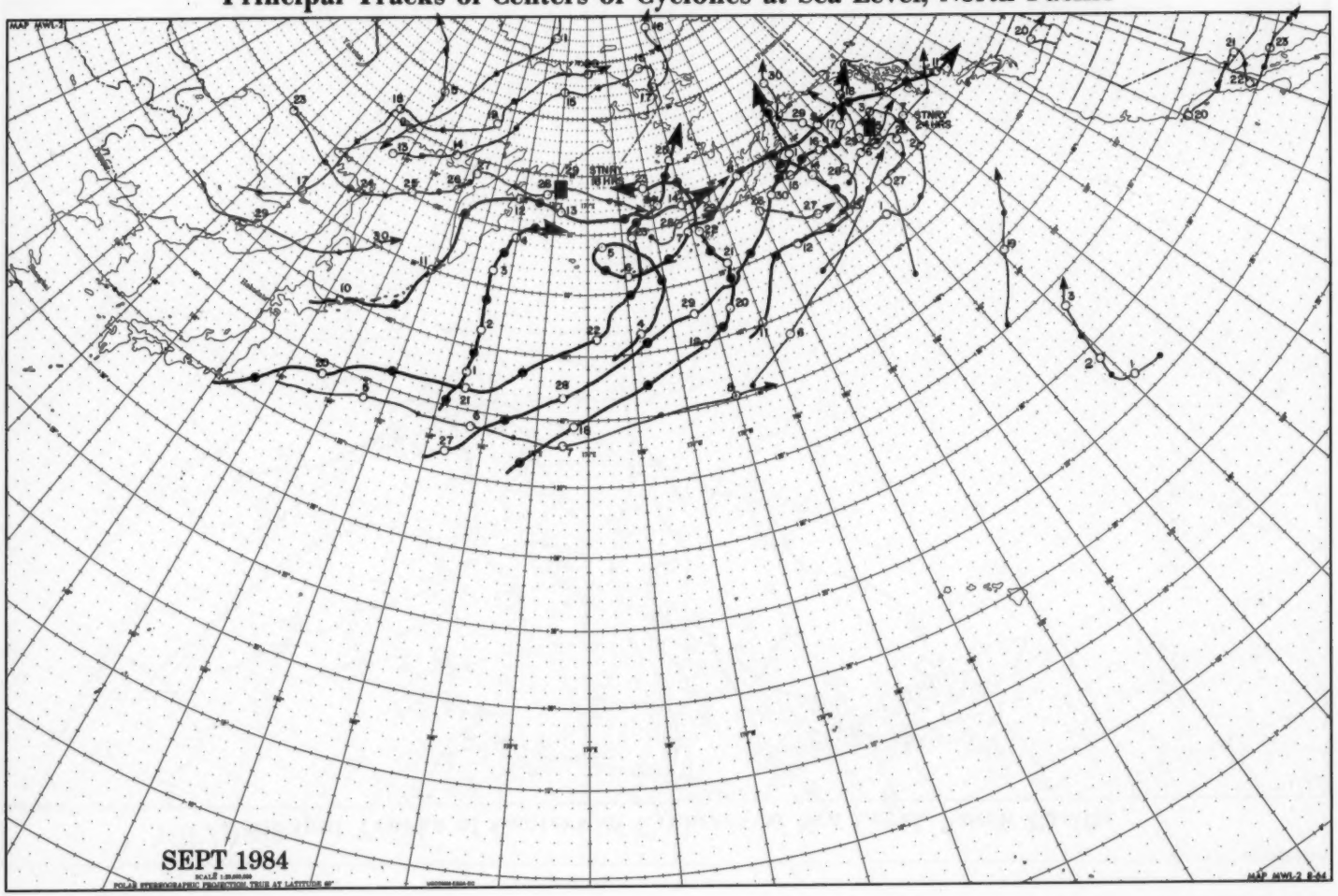
heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

Principal Tracks of Centers of Cyclones at Sea Level, North Pacific



Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates stationary center. Cyclone tracks marked with heavy line are described in the Weather Log.

North Atlantic Selected Gale and Wave Observations

July, August and September 1984

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10's	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10's	Swell Waves Period sec.?	Swell Waves Height ft.
	ATLANTIC	JULY															
	HBDP	1	33.0 N	74.3 W	06	19	40	< 50 YD	97	1011.0	25.5	27.0	XX	5	04	XX	6.5
	KNDB	1	39.6 N	66.1 W	12	26	25	10 NM	02	1009.5	25.0	26.7	6	8	24	7	19.5
DEFIANCE	KRBS	3	42.1 N	36.4 W	06	27	40	5 NM	02	1011.0	21.4	19.5	3	6.5	25	4	13
	KCBX	5	21.9 N	70.0 W	11	14	14	10 NM	01	1014.7	26.1		3	5	16	10	21
FREDERICKSBURG	KNJN	5	19.3 N	68.0 W	12	13	25	10 NM	01	1014.0	26.1	27.8	3	3	13	45	19.5
	NADH	6	36.0 N	09.5 W	18	08	M 06	10 NM	02	1016.0	22.8	14.4	2	1.5	08	4	19.5
	EAFG	8	38.0 N	66.5 W	18	20	50	50 YD		1016.0	23.0	25.5	6	10			
	NZLG	8	38.9 N	66.7 W	18	19	44	2 NM	62	1012.0	26.0	26.0	7	24.5	17	7	16.5
	WZHK	10	22.9 N	74.5 W	18	10	13	10 NM	02	1019.0	33.5	26.1	3	3	09	4	19.5
EILEEN INGRAM	WGDB	19	33.9 N	76.9 W	21	19	50		60	1020.4	21.1		8	10			
SEALAND PACER	KSLB	21	49.2 N	16.0 W	00	25	M 18	2 NM	65	1018.5	16.2	16.3	3	13	30	6	23
OVERSEAS ARCTIC	KLEZ	23	30.1 N	74.5 W	00	19	20	10 NM	02	1018.5	27.8	28.9	3	10	14	5	19.5
ESSO PALM BEACH	HPID	26	16.4 N	68.7 W	18	08	M 48	1 NM	61	1007.0	27.0	29.0	8	19.5	11	7	16.5
	ATLANTIC	AUG.															
TFL EXPRESS	9VPU	2	50.6 N	16.8 W	06	34	M 46	10 NM	02	1018.2	16.0	18.7	7	8	33	7	8
AMCO VOYAGER	KADP	2	49.7 N	11.2 W	12	29	35	10 NM	15	1013.0	16.1	19.4	2	10	29	5	16.5
AMCO VOYAGER	KADP	3	49.4 N	14.1 W	00	31	35	10 NM	01	1014.0	15.6	18.9	2	6.5	31	6	16.5
SEALAND EXPRESS	KGJD	3	49.5 N	11.1 W	06	31	36	10 NM	91	1010.5	15.0	17.0	7	8	31	7	8
FREDERICKSBURG	KNJN	3	20.2 N	71.4 W	06	10	35	5 NM	03	1016.0	26.6	28.8	4	8	10	11	14.5
SEALAND INDEPENDENCE	WGJC	3	49.0 N	12.3 W	12	32	M 31			1015.9	19.0	14.0	5	16.5	32	6	19.5
SEALAND PACER	KSLB	4	37.9 N	12.8 W	00	05	M 18	10 NM	02	1024.9	18.3	20.0	2	19.5	27	6	16.5
AMERICAN ENVOY	WPEK	5	42.3 N	46.0 W	12	21	40	2 NM	61	1009.5	25.0	23.9	8	13	21	12	19.5
AMCO VOYAGER	KADP	6	43.3 N	40.1 W	06	18	35	2 NM	61	1016.0	21.1	23.3	2	6.5	18	3	18
TEXAS TRADER	KTHC	8	42.3 N	10.1 W	00	01	36	10 NM	00	1020.7	18.9	18.9	4	11.5	01	4	11.5
ROVER	KRBS	14	36.4 N	69.4 W	06	26	35	.5 NM	61	1017.0	25.2	27.8	3	6.5	20	5	8
CHEVRON ANTWERP	ABYD	14	03.4 N	08.0 W	12	17	M 23	10 NM	16	1018.8	25.8	26.2	7	8	21	14	23
CHEVRON ANTWERP	ABYD	15	04.3 N	09.7 W	00	16	M 24	10 NM	15	1018.6	25.6	26.7	XX	10	21	14	19.5
CHEVRON ANTWERP	ABYD	16	06.4 N	14.1 W	06	21	M 18	5 NM	01	1016.5	24.5	26.7	10	10	19	14	19.5
SOUTHWEST CAPE	SLWG	16	30.0 N	74.7 W	17	32	40	5 NM		1018.0	31.1	28.9	4	8			
PITTSBURGH	KGBA	22	20.9 N	66.8 W	06	07	48	5 NM	13	1017.0	28.4	28.9	4	6.5	12	7	5
TEXAS TRADER	KTHC	23	42.0 N	46.6 W	12	27	30	10 NM	03	1012.5	21.1	23.9	7	21			
AMCO TRADER	KAAI	24	45.6 N	36.9 W	12	27	35	5 NM	03	1013.0	20.0	17.7	3	5	27	7	8
AMERICAN PURITAN	KRGB	24	45.0 N	27.6 W	12	20	40	5 NM	25	1007.5	18.3	18.9	3	5	20	5	8
RAINBOW HOPE	KNDB	25	57.6 N	36.7 W	12	29	40			1001.5	7.8		4	13	26	6	14.5
USNS MAUMEE	NSNF	26	54.5 N	35.5 W	12	28	25	5 NM	03	1010.8	10.0	11.0	6	16.5	28	8	19.5
AMERICAN PIONEER	WSFL	27	50.9 N	29.7 W	18	32	35	5 NM	02	1014.0	16.7	17.8	5	6.5	34	5	8
USCGC LIPAN (WMEC 85)	NBOZ	31	19.0 N	74.8 W	12	08	M 40	5 NM	15	1013.2	28.3		9	1.5	14	3	3
	ATLANTIC	SEP.															
ITALICA	TBWL	3	40.1 N	53.6 W	12	27	35	10 NM	03	1004.5	24.0	23.0	7	14.5	26	19	26
ROVER	KRBS	13	44.4 N	48.3 W	12	23	30	2 NM	25	1003.2	18.4	18.9	8	24.5	23	18	32.5
COMMANCHE	KICL	27	56.2 N	38.7 W	06	33	17	10 NM	03	1006.8	8.3	7.2	5	10	36	6	24.5
SEALAND VOYAGER	KMFA	28	49.3 N	21.8 W	12	32	30	5 NM	02	1006.2	18.0	17.0	10	26	32	12	19.5

+ Direction of sea waves same as wind
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 30 ft from April through September and 45 kn or 30 ft October through March.

Continued from page 52.

SHIP NAME	VIA RADIO	VIA MAIL
KRDB	25	35
KRHX	5	38
KRJG	9	31
KSFR		32
KSVE	9	96
KYIN		7
LIQL	3	82
LMWO	21	56
LRQN	11	15
LRQS	11	4
LRUB	18	21
LUJQ		35
NADH		94
NCJE		118
NEYV		6
NJAX	59	88
NJOV	68	118
NJTD	42	75
NSHI		36
NTRE		3
NTRI	118	222
NYGG	88	147
NZIT	14	23
ONAQ	23	16
OVPU		92
OWCJ	45	
OWEY		24
OXTZ	56	126
OYRJ	12	35
PPFD		33
S6CT		19
S6GQ	5	29
STXN		1
VPBH	12	
VPBW	73	158
WAHR		17
WBVY	9	11
WDBZ		38
WDZB	86	133
WEZA	8	75
WFPJ		10
WFVQ		11
WGZK		23
WKIY		16
WLDP		18
WLDU		29
WLGF		16
WLGH		
WLHC		36
WMDM		
WPFZ		3
WSHR		
WXBG		
WXHK		
WZHK		39
WZJN		
YEXW		50
ZCKP		41
ZCUT		34
ZLCF4		
ZLDT5		

VIA RADIO	VIA MAIL
10	14
	11
23	73
16	
18	43
29	50
16	47
	119
36	116
	7
	5
	57
	45
	2
39	158
	53
50	60
41	80
34	83
	33
	48

SUMMARY: GRAND TOTAL VIA RADIO 26052 GRAND TOTAL VIA MAIL 58622

Closed circle indicates 0000 and open circle 1200 GMT positions. Square indicates heavy line are described in the Weather Log.

North Pacific Selected Gale and Wave Observations

July, August and September 1984

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. deg	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves? Period sec.	Sea Waves? Height ft.	Swell Waves Dir. deg	Swell Waves Period sec.*	Swell Waves Height ft.
	PACIFIC	JULY															
	D7QY	1	48.8 N	131.4 W	18	27	N 11	< 50 YD		1020.0	15.0	13.0	13	8	27	20	28
	DDKX	3	51.0 N	170.3 E	00	22	44	1 NM	10	1016.0	7.5	7.0	6	6.5	24	8	14.5
EXXON HOUSTON	KMBA	6	39.6 N	124.8 W	00	34	40	5 NM	02	1008.3	15.5	13.5	7	14.5	34	10	11.5
PACKING	ELBX3	7	38.6 N	129.0 W	00	36	N 36	10 NM	02	1018.0	18.0	15.0	7	10	36	13	19.5
AMERICAN LANCER	WZJB	8	35.3 N	128.9 W	18	03	21	10 NM	02	1017.3	16.1	15.0	10	16.5	03	16	19.5
PRESIDENT MADISON	WC3P	10	38.2 N	127.2 W	00	36	N 31	10 NM	02	1019.5	14.4	12.2	7	11.5	34	9	21
CORNUCOPIA	KPJC	13	38.9 N	136.0 E	06	22	40	1 NM		0991.5	22.3	20.0	6	8	21	8	8
MEONIA	OXON	14	34.9 N	122.6 W	00	01	27	.25 NM	43	1007.2	15.8		2	1.5	31	6	19.5
	ELCF4	14	48.5 N	129.3 W	18	34	N 48	> 25 NM	02	1025.0	15.0	14.0					
WESTWARD VENTURE	KMJB	16	56.3 N	142.2 W	12	18	N 40	5 NM		1006.3	10.5	11.1					
PORTLAND	WNDF	16	55.8 N	141.0 W	18	21	29	5 NM	20	1014.0	12.2	10.6	8	17	20	14	19.5
PORTLAND	WNDF	17	54.6 N	138.3 W	00	22	28	5 NM	01	1020.0	15.6	10.0	5	11.5	21	10	19.5
CHEVRON OREGON	WNHL	17	42.4 N	125.0 W	00	34	N 42	5 NM	02	1013.6	15.6		3	8	35	8	8
MISSION SANTA CLARA	WKJO	17	49.3 N	127.4 W	06	32	40	5 NM	02	1019.0	13.9	13.9	6	13			
MEONIA	OXON	18	41.4 N	167.9 W	18	15	18	200 YD	58	1010.3	14.1		6	13	12	10	26
MEONIA	OXON	19	42.2 N	177.9 W	18	36	38	2 NM	51	1009.1	12.8		6	16.5	01	12	29.5
KOREAN WONIS SUN	D7KR	20	46.5 N	163.8 W	00	10	25	.25 NM	07	1010.7	14.0	9.0	6	5	10	9	21
	WDNF	21	39.8 N	127.2 W	21	35	N 28	5 NM	02	1017.0	15.0	15.0	8	13	35	12	19.5
PACIFIC ANGEL	3EXQ2	27	51.6 N	146.4 W	12	15	N 40	.25 NM	59	1006.0	12.0		7	11.5	15	7	13
	PACIFIC	AUG.															
ARCTIC TOKYO	SLJT	1	52.9 N	167.3 E	00	31	N 41	.5 NM	77	0991.0	8.0	9.0					
EXXON PHILADELPHIA	WNFJ	1	55.2 N	139.3 W	00	33	N 35	10 NM		1001.9	15.5	12.8	6	6.5	29	8	13
CHEVRON OREGON	WNHL	1	39.6 N	124.7 W	00	35	N 35	5 NM	02	1014.2	15.6		4	8	35	10	10
SEALAND LIBERATOR	KHRP	1	49.4 N	174.1 E	06	27	N 36	5 NM	02	1000.3	12.0	10.0	2	11.5	27	8	0
SANKO LAPIS	ELDW7	1	53.6 N	173.1 W	12	14	N 35	50 YD	12	0997.5		17.0	2	11.5			
SANKO LAPIS	ELDW7	2	53.1 N	178.2 W	00	23	N 40	1 NM	10	0991.0	11.0	13.0	2	14.5	14	6	8
WOOD STAR	WDWB	2	51.0 N	178.8 E	00	24	N 31			0997.2	10.8	7.0	4	3	24	7	23
JAPAN RAINBOW	3ELX	2	45.7 N	177.4 W	18	32	N 40	5 NM		1002.5	12.0	12.0	6	10	32	14	19.5
JAPAN RAINBOW	3ELX	3	45.5 N	175.9 W	00	31	N 40	.25 NM		0997.5	11.0	10.0	6	10	31	14	19.5
	GVPU	3	47.1 N	176.0 W	00	36	40			1001.0	12.8	9.0	10	18			
PETERSBURG	WJDC	3	41.2 N	125.9 W	12	08	44	10 NM	01	1022.0	16.7		4	1.5	33	5	6.5
EXXON PHILADELPHIA	WNFJ	4	54.5 N	138.8 W	17	13	N 36	2 NM	25	0995.0	16.5	12.8	5	14.5	13	5	14.5
JUNO	SMZH	5	50.1 N	167.7 E	05	15	N 13			1011.5	12.0	15.0	55	24.5	15	55	24.5
SUNBELT DIXIE	DSRU	6	17.4 N	102.2 W	00	10	N 45	2 NM	80	1008.0	25.0	28.8					
TOKYO RAINBOW	H3DB	7	47.4 N	129.0 W	00	16	31			1015.1	14.3	17.0	13	24.5	17	19	19.5
AMERICAN TRADER	WEZH	7	25.8 N	120.7 E	06	36	38	1 NM	64	0991.5	29.4	28.9	7	8	36	5	8
LOUIS MAERSK	OXMA	7	27.6 N	125.6 E	09	12	N 36	10 NM	03	1000.0	29.5		8	13			
NORTHERN HIGHWAY	JKMG	7	18.3 N	106.2 W	15	14	N 38	2 NM	63	1012.0	26.0	28.0	5	13	26	8	10
SEALAND INNOVATOR	WGKF	7	26.3 N	122.7 E	15	14	N 40	5 NM	81	0995.1	26.5	27.0	6	14.5	07	7	13
	3HFN2	9	41.8 N	174.9 W	08	07	N 57	5 NM	01	1023.0	15.0						
GREAT LAND	WFDP	11	57.7 N	146.8 W	18	33	N 20	10 NM	02	1010.9		14.4	2	1.5	30	30	34.5
LARS MAERSK	OXMD	12	44.3 N	148.3 E	00	19	N 38	< 50 YD	44	1001.0	16.0		4	3			
	D5DW	13	43.9 N	160.8 E	00	28	N 35	5 NM	02	0999.0	18.0	19.0	9	14.5			
SEA WORLD	DVJB	13	49.1 N	161.0 W	00	11	N 40	200 YD		1012.0	14.0	13.0	3	5	11	6	6.5
SEVEN OCEAN	DZPA	13	43.4 N	159.3 E	00	27	N 34	5 NM	40	0998.5	19.0	19.0	14	14.5	28	18	19.5
ORIENTAL MINISTER	ELDK3	13	40.8 N	159.9 E	06	30	35	5 NM	03	1004.5	21.0	20.0	10	5	30	13	11.5
TRITON	S6FA	13	41.8 N	157.0 E	06	31	N 35	5 NM	01	1005.5	19.0	18.5	7	6.5	32	11	10
SEALAND INNOVATOR	WGKF	13	42.0 N	155.5 E	06	31	N 33	5 NM	00	1010.0	18.5	18.0	5	13	32	9	19.5
TYSON LYKES	WSCJ	13	41.0 N	161.4 E	12	17	37	5 NM	25	1009.9	15.5	16.7	7	6.5	29	7	10
MARIA TOPIC	SMPS	14	23.3 N	121.8 E	03	04	40	2 NM	81	1000.0	27.0	30.0	8	10	04	9	10
CHEVRON OREGON	WNHL	14	39.2 N	124.5 W	06	33	N 36	5 NM	02	1014.1	14.4		4	6.5	33	7	10
SKOUBORG	LICN	14	41.3 N	165.5 E	12	30	N 27			1002.0	18.0	19.0	11	19.5			
FRANCIS SINCERE NO 6	SMCN	14	40.0 N	157.1 E	18	32	N 35	10 NM	03	1011.0	19.0	19.0	4	10	34	8	13
FRANCIS SINCERE NO 6	SMCN	15	40.3 N	158.2 E	00	26	N 33	10 NM	15	1011.0	18.5	19.0	5	10	36	8	19.5
	SLUB	16	22.6 N	135.4 E	06	15	N 45	2 NM	64	1004.0	26.0						
LNG TAURUS	WDZW	16	25.8 N	132.1 E	12	09	N 43	5 NM	07	1004.0	28.0	28.9					
MOBIL MERIDIAN	WGSM	17	51.3 N	131.1 W	18	20	35	10 NM	82	1011.9	15.0	13.9	5	10	28	6	8
SEALAND DEVELOPER	KNPN	17	39.4 N	128.6 E	18	35	N 35	5 NM	02	1018.8	16.2	15.0	6	11.5	35	8	19.5
PRESIDENT JOHNSON	WWHS	17	27.8 N	129.4 E	18	09	45	10 NM	25	0998.5	29.4	29.4	12	28	09	14	28
SEALAND MARINER	KGJF	18	25.9 N	122.2 E	00	29	52	5 NM	03	0993.8	24.0	27.0	6	8	29	12	19.5
PRESIDENT JOHNSON	WLDP	18	19.7 N	128.4 E	06	24	45	.25 NM	63	0995.5	24.7	27.8	9	5	22	12	16.5
	WWHS	18	26.9 N	128.1 E	06	07	60	2 NM		0986.0	25.6	28.9	12	28	07	15	28
	WJOV	19	20.7 N	123.8 E	21	25	32	5 NM	00	0997.0	27.2	26.1	15	19.5	33	12	10
PRESIDENT PIERCE	WURV	19	48.2 N	168.6 W	12	18	35	2 NM	58	1013.0	12.2	10.6	4	10	18	7	8
	3HFN2	19	26.2 N	130.5 E	16	18	N 40			0999.0	28.0						
PRESIDENT JOHNSON	WWHS	19	27.1 N	128.2 E	18	18	60	2 NM	25	0986.0	25.0	23.3	10	28	18	20	28
	WLDP	20	24.4 N	128.9 E	06	20	40			1001.8	29.0	26.1	3	5	22	10	16.5
NOAA SHIP CHAPMAN	WTED	20	57.8 N	173.2 W	12	06	N 35	5 NM	00	0991.8	10.3	9.3	XX	10	09	5	10
AQUARIUS	WSKJ	21	29.1 N	127.4 E	06	26	N 29			1002.0	29.0	26.7	7	6.5	29	8	19.5
SEA WORLD	DVJB	21	38.8 N	127.7 W	12	32	N 18			1017.5	17.5	17.0	6	11.5	33	10	19.5
ORIENTAL EXECUTIVE	DSAN	22	53.9 N	153.8 W	12	26	N 36	5 NM	11	1015.0	15.5	14.0					
ARCTIC TOKYO	SLJT	22	42.0 N	145.0 E	18	09	N 35	5 NM	51	0993.0	14.0	20.0					
ORIENTAL EXECUTIVE	DSAN	24	54.0 N	175.9 W	06	33	N 50	.25 NM	45	0998.6	14.5	11.0	7	10	31	11	14.5
EVER SUPERB	HOKF	24	46.7 N	166.3 W	08	18	N 26	50 YD	45	1010.0	16.0	11.0	8	23	18	9	24.5
USCGC MIDGETT (WHEC 726)	NNWR	24	56.8 N	173.7 W	12	36	N 41	5 NM		0985.1	10.0	7.5	5	5	36	8	13
BARBER YOBA	LNOE	24	38.4 N	174.2 E	18	05	N 35	1 NM	65	1001.5	17.0		5	10			
ALEUTIAN DEVELOPER	WIPL	24	58.1 N	153.9 W	18	22	N 42	1 NM	63	0991.2	14.2		3	8	22	6	11.5
MELBOURNE HIGHWAY	3ERW2	24	53.6 N	171.8 W	23	17	N 40	.25 NM	52	0998.0	13.0	13.0	7	10	01	8	11.5
EVER LINKING	3ERJ2	25	38.0 N	174.9 E	00	19	N 37			1000.0	24.0	23.0	5	8	18	8	8
ALEUTIAN DEVELOPER	WIPL	25	56.7 N	156.5 W	06	21	N 40			0987.3	14.0	11.7	5	6.5	22	7	13
PETERSBURG	WJDC	25	43.3 N	127.8 W	12	35	43	10 NM	03	1016.5	16.7	15.6	4	6.5	28	6	5
GALVESTON	KBCA	25	56.4 N	145.0 W	18	23	35	5 NM	18	0997.0	11.7	12.8	8	13	23	8	13
PRESIDENT LINCOLN	KDPG	25	31.3 N	131.5 E	18	08	N 40	200 YD	65	1004.3	25.6	26.7	6	6.5	08	8	10
EXXON NORTH SLOPE	KNLG	25	58.5 N	143.2 W	18	27	N 30	5 NM	02	0989.0	13.3	13.9	8	19.5	27	8	19.5
GREAT LAND	WFDP	25	56.7 N	143.7 W	18	30	N 45	2 NM	07	1004.4	15.6	14.4	5	8	30	10	13
PHILADELPHIA	WJGO	25	54.0 N	136.0 W	18	25	N 23	1 NM		1009.1	16.1	15.6	3	8	29	5	19.5
	WOEJ	26	48.7 N	176.9 E	12	23	35			0991.0	9.0	14.0	8	11.5	23	8	13
MOBIL MERIDIAN	WGSM	26	57.2 N	141.3 W	12	27	48	10 NM	07	0998.8	11.6	12.7	4	6.5	27	12	23
	KPED	26	54.5 N	148.8 W	18	24	40	10 NM	00	1017.0	11.6	12.8	6	19.5	21	12	11.5
GREAT LAND	WFDP	26	58.0 N	148.8 W	18	28	N 55	10 NM	02	1000.6	12.8	13.3	8	14.5	28	12	19.5
ALEUTIAN DEVELOPER	WIPL	26	53.8 N	168.5 W	18	10	N 38	10 NM	20	1018.0	9.7	7.8	4	6.5	11	7	13
PHILADELPHIA	WJGO	26	57.4 N	142.0 W	18	27	N 38	5 NM	00	0997.6	12.2	13.9	4	11.5	29	10	32.5
NEWARK	WNDO	26	58.5 N	149.7 W	18	30	N 39	10 NM	00	1008.6	9.4	11.7	3	5	30	8	23
CHEVRON COLORADO	KLMZ	27	55.8 N	153.4 W	00	32	N 35	10 NM	03	1024.5	10.6		4	10	34	9	14.5
GREAT LAND	WFDP	27	58.3 N	149.6 W	00	30	N 42	5 NM	02	1011.2	12.2	12.2	8	14.5	30	14	19.5

Vessel	Nationality	Date	Position of Ship Lat. deg.	Position of Ship Long. deg.	Time GMT	Wind Dir. 10°	Wind Speed kt.	Visibility n. mi.	Present Weather code	Pressure mb	Temperature °C Air	Temperature °C Sea	Sea Waves* Period sec.	Sea Waves* Height ft.	Swell Waves Dir. 10°	Swell Waves Period sec.*	Swell Waves Height ft.
	PACIFIC	AUG.															
PHILADELPHIA	WJGO	27	57.7 N	143.5 W	00	32	M 43	5 NM	00	1000.5	17.6	13.9	4	19.5	29	10	32.5
NEWARK	WNDO	27	57.6 N	147.3 W	00	29	M 37	10 NM	00	1029.5	10.0	11.7	5	14.5			
ORIENTAL EXECUTIVE	DSAN	27	42.0 N	150.6 E	12	13	M 35	5 NM	58	1007.5	19.0	19.0					
MOBIL MERIDIAN	KGSN	27	53.1 N	134.7 W	12	29	43	2 NM	25	1006.0	13.3	13.9	4	8	29	12	18
EVER LINKING	3EPJ2	27	36.6 N	149.4 E	18	25	M 35	5 NM	18	0999.0	23.0						
	DZSD	27	40.4 N	151.4 E	18	10	37	2 NM	81	0998.0	18.0						
SOHIO INTREPID	KACK	27	51.1 N	133.6 W	18	30	35			1012.2	15.0	16.1	3	10	32	6	21
MOBIL ARCTIC	KSPY	27	46.9 N	131.6 W	18	34	17	10 NM	00	1026.0	17.2	15.6	8	19.5	32	10	10
OVERSEAS JUNEAU	WWND	27	50.1 N	132.8 W	18	29	37	10 NM	16	1012.9	17.2	14.4	5	10	31	7	19.5
	D7YL	28	12.0 N	127.7 E	00	20	M 46	5 NM	03	1003.5	31.0		8	16.5	28	6	10
SOHIO INTREPID	KACK	28	51.7 N	134.1 W	00	31	35	5 NM	01	1015.4	15.0	15.5	4	10	31	8	13
GOLDEN DAISY	6ZSG	28	41.6 N	155.4 E	01	04	M 35	10 NM	25	1005.0	19.0	17.0	7	14.5	04	9	14.5
ORIENTAL EXECUTIVE	DSAN	28	38.5 N	145.1 E	06	33	M 25	5 NM	01	1006.5	23.0	24.0	6	6.5	33	10	19.5
MOBIL ARCTIC	KSPY	28	48.4 N	130.0 W	06	31	30	5 NM	00	1031.0	13.9	13.9	12	23	31	6	13
OVERSEAS JUNEAU	WWND	28	52.9 N	135.4 W	12	27	18	10 NM	02	1013.0	13.3	11.1	5	6.5	30	10	21
AMERICAN AQUARIUS	WYBI	28	12.1 N	140.9 E	21	22	38	200 YD	81	0999.0	25.0	28.9	6	10	21	6	11.5
MELBOURNE HIGHWAY	3ERW2	28	42.7 N	151.5 E	21	07	M 36	.5 NM	45	1003.0	16.0	14.0	9	8	18	11	10
	D7YL	29	13.8 N	131.9 E	00	21	M 21			1007.0	31.0	32.0	5	16.5	21	10	19.5
AMERICAN AQUARIUS	WYBI	29	12.1 N	139.8 E	00	35	35	200 YD	81	1003.0	25.0	28.9	4	8	27	6	10
BARBARA FOSS	WYL4978	29	56.9 N	135.9 W	12	15	M 35			1013.2	12.5		3	5	21	7	6.5
SEA ASTRA	HPDO	29	34.2 N	158.7 W	18	07	M 25	10 NM	01	1020.0	23.0	25.0	6	21	07	6	21
WORLD PROBITY	D5AL	30	46.4 N	152.3 E	00	07	M 25	.5 NM	40	1017.0	14.0	8.0	6	13	07	10	21
GREEN WOOD	3FRB2	30	40.6 N	148.9 E	12	02	M 32			1006.0	18.0	19.0	9	16.5	02	12	19.5
GREEN WOOD	3FRB2	31	41.9 N	151.6 E	00	02	M 30			1006.5	18.0	21.5	9	16.5	02	12	19.5
EVER TRUST	BXMO	31	33.0 N	156.9 E	06	32	M 27			0999.0	27.0	24.0	5	19.5	04	7	1.5
CHEVRON COLORADO	KLMZ	31	56.9 N	145.7 W	06	32	M 36	2 NM	63	1005.8	10.6		3	5	34	6	6.5
	PACIFIC	SEP.															
SAMUEL S	SLHX	5	42.2 N	175.1 E	00	25	M 28	2 NM	80	1001.0	18.0	18.0	5	13	27	9	28
SAMUEL S	SLHX	6	42.2 N	170.9 E	00	29	M 32	2 NM	96	1006.0	16.0	17.0	5	11.5	28	14	26
PRESIDENT JEFFERSON	WPEE	7	48.9 N	143.5 W	18	27	50	5 NM	50	1009.0	14.4	13.3	3	6.5	27	6	10
MOBIL ARCTIC	KSPY	9	26.7 N	117.5 W	00	27	45	1 NM	61	1007.8	23.9	22.2	10	29.5			
SEALAND FREEDOM	WGJW	12	50.2 N	169.0 E	06	23	M 22	200 YD		1000.0	12.0	11.0	5	8	21	6	24.5
HANJIN INCHEON	3EUB	13	50.3 N	149.1 W	00	09	M 37	.5 NM	62	0993.5	12.5	12.0	10	21	10	12	24.5
OVERSEAS JUNEAU	WWND	14	57.2 N	141.5 W	06	11	50			1001.6	11.7	11.7	6	13	13	10	26
	6ZTO	16	48.9 N	175.1 W	18	30	M 10	5 NM	02	1020.0	10.0	10.0	2	1.5	03	30	32.5
NEW INDEPENDENCE	SMOS	19	46.5 N	175.2 W	18	04	M 50			1010.0	11.0	12.0	9	19.5	06	12	19.5
NEW INDEPENDENCE	SMOS	20	46.4 N	174.5 W	00	03	M 50	200 YD	81	0985.0	11.0	12.0	10	19.5	04	8	19.5
	WEZA	20	13.1 N	124.8 E	18	04	10	10 NM	01	1009.5	26.7	27.2	2	3	03	10	34.5
	OXTZ	21	41.2 N	155.8 E	06	02	M 53	5 NM	05	0995.0	18.8	18.0	8	16.5			
PUERTO RICAN	WDJU	22	10.2 N	67.0 W	12	25	15	10 NM	03	1008.9	25.6	25.0	8	5	24	9	39
PHILADELPHIA	WJGO	22	53.8 N	135.6 W	18	04	M 09	10 NM	00	1023.3	16.1	13.9	5	6.5	29	10	24.5
VAN CONQUEROR	A8TB	23	47.1 N	173.4 E	00	28	M 52	5 NM	03	0994.5	9.0	11.0	10	16.5	28	13	21
ORIENTAL SOVEREIGN	A8UH	23	48.1 N	174.3 W	18	24	M 52	7 NM	58	1000.0	10.0	10.0					
	H8YG	26	13.2 N	132.8 W	18	11	M 64	> 25 NM	01	1014.0	33.0	27.0			35	9	6.5
	WLDU	30	56.8 N	142.2 W	00	18	30	10 NM	01	0996.0	12.2	11.1	5	13	14	9	26
CHARLOTTE LYKES	WPHZ	30	40.3 N	173.2 E	00	31	25	10 NM	02	1023.0	19.0	18.0	5	8	30	7	31
PRESIDENT JEFFERSON	WPEE	30	43.0 N	169.5 W	06	27	50	10 NM	02	1010.2	15.6	10.6	4	8	22	6	19.5

+ Direction for sea waves same as wind direction
X Direction or period of waves indeterminate
M Measured wind

NOTE: The observations are selected from those with winds ≥ 40 kn or waves ≥ 20 ft from April through September and 45 kn or 30 ft October through March.

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U.S. Voluntary Observing Ship Weather Reports

July, August and September 1984

SHIP NAME	VIA RADIO	VIA MAIL
ABUL KALAM AZAD	7	
ACADIA	15	
ADAM E. CORNELIUS	22	
ADDIRIYAH	16	1
ADRIAN MAERSK	6	29
AIDA	2	
AL AHMADIAH	52	155
ALASKA STANDARD	26	41
ALASKAN	63	180
ALBERT MAERSK	47	110
ALBULA	11	148
ALEUTIAN DEVELOPER	12	20
ALMERIA LYKES	61	105
ALVA MAERSK	34	24
AMADEUS		121
AMCO TRADER	35	129
AMCO VOYAGER	66	151
AMERICAN ALTAIR	61	186
AMERICAN APOLLO	64	165
AMERICAN AQUARIUS	81	132
AMERICAN ARGO	56	194
AMERICAN ASTRONAUT	58	84
AMERICAN DRACO	24	120
AMERICAN ENVOY	67	166
AMERICAN LANCER	43	112
AMERICAN LARK	48	226
AMERICAN LEGION	8	48
AMERICAN LIBERTY	47	197
AMERICAN LYNX	127	163
AMERICAN MARKETER	78	209
AMERICAN MERCHANT	94	73
AMERICAN PIONEER	65	121
AMERICAN PURITAN	25	186
AMERICAN RESERVIST	45	150
AMERICAN RESOLUTE	66	172
AMERICAN RIGEL	10	43
AMERICAN SKY	51	104
AMERICAN SUN	33	108
AMERICAN TITAN AK 1008	57	57
AMERICAN TRADER	53	81
AMERICAN VEGA	37	117
AMERICANA	52	94
AMOCO BALTIMORE	48	
ANDERS MAERSK	3	
ANJA LEONHARDT	2	
AQUA CITY	83	102
AQUARIUS	45	123
ARCHON	38	36
ARCO ALASKA	30	43
ARCO ANCHORAGE	3	
ARCO CALIFORNIA	34	65
ARCO FAIRBANKS	33	33
ARCO INDEPENDENCE	2	
ARCO JUNEAU	28	21
ARCO PRUDHOE BAY	25	
ARCO SAG RIVER	19	11
ARCO SPIRIT	10	
ARCO TEXAS	22	22
ARCTIC TOKYO	39	177
ARGONAUT	45	120
ARILD MAERSK	9	26
ARMAND HAMMER	5	88
ARMCO	98	29
ARTHUR M ANDERSON	31	41
ASHLEY LYKES	9	
ASIA NO 14	19	19
ATIGUN PASS	89	286
ATLANTIC RAINBOW	13	
AUSTANGER	6	30
AXEL JOHNSON	18	37
AZTECA	9	
B.T. ALASKA	48	162
B.T. SAN DIEGO	62	284
BALLARD		57
BALSA NO 7		112
BALTIMORE TRADER	75	134
BARI ZAN	39	91
BARBAROSSA	23	97
BARBER TAIF	22	38
BARBER TENNESSEE	23	
BARBER TEXAS	19	38
BARBER TOBA	34	62
BARBER TONSBERG	4	29
BAY BRIDGE	136	79
BAYAMON	42	124
BELO RIO	53	176
BENSON FORD	140	115
BERNINA	39	72
BLUE COSMO	30	69
BOGASARI DUA	57	
BOGASARI LIMA	28	113
BOHEME	31	45
BORINQUEN	90	188
BRIGHT SUN	73	173
BRINTON LYKES	15	14
BROOKS RANGE	7	20
BUNGA MELAWIS	40	112
BURNS HARBOR		130
CALCITE II	4	
CARIBE MAR	5	
CASON J. CALLOWAY	7	18
CENPAC 2	23	60
CHARLES E. WILSON		133
CHARLES LYKES	62	99
CHARLES M. BEEGHLEY	40	
CHARLOTTE LYKES	7	32
CHARLOTTE MAERSK	37	161
CHASTINE MAERSK	14	74
CHEMICAL PIONEER	60	121
CHERRY VALLEY	57	197
CHESAPEAKE	40	135
CHESNUT HILL	7	
CHEVRON ANTWERP	25	199
CHEVRON ARIZONA	24	58
CHEVRON CALIFORNIA	64	152
CHEVRON COLORADO	38	118
CHEVRON COPENHAGEN	65	186
CHEVRON FELUY	70	23
CHEVRON FRANKFURT	78	134
CHEVRON LOUISIANA	21	36
CHEVRON MISSISSIPPI	60	190
CHEVRON OREGON	17	89
CHEVRON PERTH		47
CHEVRON ROME		26
CHEVRON WASHINGTON	7	4
CHRISTIAN MAERSK	43	88
CHUEN ON	34	90
CITADEL HILL		42
CLARA MAERSK	28	73
CLIFFORD MAERSK	22	34
CLOVER TRUST	20	
COLUMBIA STAR		97
COLUMBUS AMERICA	103	
COLUMBUS LOUISANA	38	
COMMANCHE	10	60
CONTINENTAL FRIENDSHIP	3	85
CONTRACT TRADER	1	
COPIAPO		82
CORNUCOPIA	31	152
COVADONGA	9	64
CRYSTAL STAR	36	60
CYGNUS	68	113
D'ALBERTIS	7	13
D.L. BOWER		146
DA MOSTO	10	42
DACEBANK	104	
DAVID D. IRWIN	5	
DAVID P. REYNOLDS	47	55
DAVID PACKARD		96
DEL ORO	11	
DELAWARE TRADER	47	82
DELTA NORTE	4	
DELTA SUD	4	16
DIANA	3	29
DISCOVERER SEVEN SEAS	194	317
DOCTOR LYKES	34	150
DOLLY TURMAN	40	112
DOMINA	14	
DRAGOR MAERSK	50	142
DUBHE	23	32
EASTERN BRIDE	40	
EASTERN DIAMOND	16	117
EASTERN FRIENDSHIP	39	
EASTERN GLORY	26	114
EASTERN PACIFIC	20	25
EASTERN ROYAL	48	10
EASTERN VENTURE	28	
EATON GLORIA	107	
EDGAR B. SPEEP		61
EDGAR M. QUEENY	24	
EDITA	9	
EDWARD B. GREENE	73	101
EDWIN H GOTT		106
ELIZABETH LYKES	78	103
ERNEST R BREECH	77	72
ESSO PALM BEACH	35	144
EVER FORTUNE	5	45
EVER LAUREL	14	58
EVER LEVEL	39	45
EVER LINKING		83
EVER LIVING	20	49
EVER LOADING		54
EVER SHINE	9	187
EVER SPRING	8	8
EVER SUPERB	53	137
EVER TRUST		178
EVER VALIANT	47	129
EVER VALUE	5	75
EVER VIGOR	2	42
EVER VITAL	64	
EXPORT CHALLENGER	26	97
EXPORT CHAMPION	29	74
EXPORT FREEDOM	15	107
EXPORT PATRIOT	29	162
EXXON BALTIMORE	14	23
EXXON BATON ROUGE		1
EXXON BAYTOWN	1	
EXXON BOSTON	89	118
EXXON GETTYSBURG	6	7
EXXON HOUSTON	51	65
EXXON JAMESTOWN	27	59
EXXON LEXINGTON	28	55
EXXON NEW ORLEANS	16	5
EXXON NORTH SLOPE	24	27
EXXON PHILADELPHIA	12	29
EXXON PRINCETON	74	119
EXXON SAN FRANCISCO	13	21
EXXON WASHINGTON	12	4
EXXON YORKTOWN	63	124
FALSTRIA	94	184
FEDERAL BULKER	8	
FERNCROF	38	28
FETISH	32	79
FORTALEZA	77	272
FRANCIS SINCERE NO 6	42	68
FREDERICK LYKES	49	93
FREDERICKSBURG	29	78
FRIENDSHIP	52	
FRISKY	27	5
FROTASIRIUS	2	15
GALLEON DIGNITY	34	197
GALLEON HONOR	1	58
GALLEON PRIDE	10	200
GALLEON TRUST	7	9
GALVESTON	44	153
GAMA GETAH		70
GAMA ROBUSTA	9	
GEMINI	11	
GENEVIEVE LYKES	7	71
GEORGE A. SLOAN	12	45
GEORGE A. STINSON		106
GERONIMO		58
GLACIER BAY	30	
GLOBAL FRONTIER	58	140
GLOBE TRADER	50	
GOLDEN APO	7	19
GOLDEN DAISY		50
GOLDEN GATE	4	10
GOLDEN GRAMPUS	35	54
GOLDEN HAWK	33	
GOWA	67	
GREAT LAND	33	126
GREAT OCEAN	35	47
GREEN FOREST	23	35
GREEN MAYA	42	91
GREEN STAR	12	
GREEN SUMA	7	
GREEN WOOD		87
H. LEE WHITE		119
H.J. HAYNES		36
HAI HONG	48	99
HANJIN INCHEON	26	35
HANJIN KWANGYANG		86
HANJIN POHANG	14	25
HANJIN SEOUL	19	31
HARBOUR BRIDGE	102	141
HARDANGER		4
HERBERT C. JACKSON	75	75
HILLYER BROWN	10	15

SHIP NAME	VIA RADIO	VIA MAIL
HOEGH CAIRN	1	10
HOEGH CLIPPER	16	
HOEGH DENE	1	6
HOEGH MARLIN	16	79
HOEGH MASCOT	7	
HOEGH MIRANDA	14	12
HOHSING ARROW	5	250
HOHSING BREEZE	52	101
HONESTY	23	
HOTAKA MARU	77	39
HOWELL LYKES	5	76
HUAL TRAVELLER	30	
HYUNDAI # 21	28	37
HYUNDAI # 23	17	
HYUNDAI CON # 22	23	45
IMPERIAL		61
INGER	52	162
IRIS ISLAND	67	44
IRVIN L. CLYMER	13	28
ITALICA	30	81
J. LOUIS	24	74
J.A.W. IGLEHART	34	
J.L. MAUTHE	82	32
J.T. HIGGINS		185
JADE PHOENIX	129	77
JALAMOKAMBI	5	
JALAVIHAR	14	38
JALAVIJAYA	33	
JAMES LYKES	4	
JAPAN APOLLO	47	25
JAPAN RAINBOW	21	80
JEAN LYKES	17	56
JOHN G. MUNSON	18	82
JOHN LYKES	48	84
JOSEPH LYKES	16	17
JUNO	42	36
JUPITER NO 1	23	27
JUSTINE FOSS		107
KAUAI	24	55
KEIYO	15	17
KENAI	29	120
KENWOOD	27	143
KEYSTONE CANYON	14	30
KEYSTONER	48	143
KIWALAN	24	
KOFUKU MARU	28	150
KOREAN AMETHYST	26	
KOREAN FIR	25	9
KOREAN JACEWON	68	159
KOREAN PRIDE	26	
KOREAN WONIS JIN	46	40
KOREAN WONIS ONE	13	35
KOREAN WONIS SEVEN	29	45
KOREAN WONIS SUN	28	13
KPPAN	9	
KYOHO MARU	44	
LARS MAERSK	20	69
LASH ATLANTICO	28	73
LASH ITALIA	21	71
LASH PACIFICO	10	66
LAURA MAERSK	32	90
LAUST MAERSK	32	96
LAVAUX	53	110
LEDA MAERSK	40	55
LEISE MAERSK	42	72
LEO	1	
LESLIE LYKES	18	
LEWIS WILSON FOY		151
LEXA MAERSK	22	29
LICA MAERSK	52	58
LILLOOET	35	82
LNG TAURUS	23	181
LONG LINES	97	115
LOUIS MAERSK	54	165
LOUISE LYKES	2	85
LUCENT STAR	12	
LUNA MAERSK	53	94
LURLINE	27	93
M P GRACE	1	
MAERSK TRITON	61	128
MAERSK WAVE		154
MAHARSHI KARVE	1	
MAJAPAHIT	1	
MALAYAN QUEEN	1	
MALLORY LYKES	41	
MAMMOTH PINE	2	
MANHATTAN DUKE	42	
MANUKAI	73	219
MANULANI	32	160
MARATHA SHOGUN	42	68
MARCONA CONVEYOR	27	57
MARDI GRAS		6
MARESK SEMBAWANG	24	112
MARGARET JOHNSON	24	68
MARGARET LYKES	22	48
MARIA TOPIC	51	82
MARITIME NOBLE	37	53
MARJORIE LYKES	11	32
MASON LYKES	23	40
MATARAM	4	
MAUI	59	197
MAURICIO DE OLIVEIRA	22	63
MELBOURNE HIGHWAY		35
MELVILLE	6	38
MEONIA	113	226
MESABI MINER		48
MICRONESIAN COMMERCE		23
MING GALAXY		49
MING GLORY	20	24
MING MOON	2	17
MING STAR	15	9
MING SUN	4	21
MING UNIVERSE	16	36
MING WINTER	1	
MISSION SANTA CLARA	55	54
MOANA PACIFIC	44	163
MOBIL ARCTIC	72	283
MOBIL MERIDIAN	47	142
MOKU PAHU	144	193
MOSMAN STAR		13
MYRON C. TAYLOR	50	97
NACIONAL MONCHIQUE	60	50
NANCY LYKES	24	39
NEPTUNE DIAMOND	21	58
NEPTUNE PEARL	30	101
NEW INDEPENDENCE	71	202
NEWARK	14	74
NICOLA PROSPERITY	7	12
NICOLET	35	78
NOAA DAVID STARR JORDA	1	
NOAA SHIP ALBATROSS IV	63	236
NOAA SHIP CHAPMAN	93	93
NOAA SHIP DAVIDSON	92	30
NOAA SHIP DELAWARE II	33	112
NOAA SHIP DISCOVERER O	2	
NOAA SHIP FAIRWEATHER	105	154
NOAA SHIP MCARTHUR	8	
NOAA SHIP MILLER FREEM	167	234
NOAA SHIP MT MITCHEL	67	125
NOAA SHIP PIERCE	59	93
NOAA SHIP RAINIER	56	
NOAA SHIP RESEARCHER	111	166
NOAA SHIP SURVEYOR	120	243
NOAA SHIP TOWNSEND CRO	101	150
NORTHERN HIGHWAY	25	22
NORWAY	29	20
OAK PEARL		45
OAK SUN		42
OAKLAND	35	45
OCEAN STEELHEAD	34	
OCEANIC	125	109
OCTA	36	147
OGDEN DYNACHEM	1	40
OGDEN THAMES	19	12
OLEANDER	121	189
OLGA TOPIC	54	199
ORCO MINER	45	
ORCO TRADER	99	185
ORIENTAL EDUCATOR	60	83
ORIENTAL EXECUTIVE	43	106
ORIENTAL EXPLORER	6	93
ORIENTAL GOVERNOR		60
ORIENTAL KNIGHT	16	48
ORIENTAL MINISTER		41
ORIENTAL SOVEREIGN	20	98
ORIENTAL TAIO	41	20
OTTO N. MILLER	19	91
OVERSEAS ALASKA	1	
OVERSEAS ARCTIC	147	208
OVERSEAS CHICAGO	1	8
OVERSEAS JUNEAU	38	126
OVERSEAS MARILYN	9	
OVERSEAS NEW YORK	8	
OVERSEAS VIVIAN	3	
PACBARON	26	
PACDUCHESS	24	27
PACDUKE	30	
PACEMPEROR	22	47
PACGLORY	9	7
PACIFIC ANGEL		96
PACIFIC ARROW	224	62
PACIFIC BRIDGE	3	3
PACIFIC ERA	6	
PACIFIC SAGA	11	
PACIFIC SUNSHINE	2	
PACIFIC VENTURE	85	
PACIFIC VICTORY	30	53
PACIFIC WING	47	
PACKING		21
PACLADY	10	
PACMAJESTY	12	13
PACMERCHANT	27	14
PACMONARCH	20	
PACNOBLE	24	
PACSTAR	19	20
PALAWAN ISLAND		20
PAN DYNASTY	2	
PAN PACIFIC		7
PARALLA	27	34
PAUL THAYER		41
PENNSYLVANIA SUN	1	
PETERSBURG	56	184
PHILADELPHIA	42	138
PHILIP R CLARKE	2	32
PHOENIX	42	
PITTSBURGH	110	200
POLAR ALASKA	1	101
POLYNESIA	166	
PONCE	2	14
PORTLAND	31	102
POTOMAC TRADER	45	21
PRESIDENT CLEVELAND	4	
PRESIDENT GRANT	57	142
PRESIDENT HOOVER	66	110
PRESIDENT JACKSON	49	70
PRESIDENT JEFFERSON	95	247
PRESIDENT JOHNSON	98	103
PRESIDENT KENNEDY	55	
PRESIDENT LINCOLN	53	136
PRESIDENT MADISON	66	187
PRESIDENT MC KINLEY	15	142
PRESIDENT MONROE	63	142
PRESIDENT PIERCE	72	183
PRESIDENT ROXAS	35	70
PRESIDENT TAFT	9	38
PRESIDENT TAYLOR	19	63
PRESIDENT TYLER	38	115
PRESIDENT VAN BUREN	42	79
PRESIDENT WASHINGTON	33	60
PRESIDENT WILSON	28	87
PRESQUE ISLE		108
PRINCE OF TOKYO	49	221
PRINCE WILLIAM SOUND	14	43
PROSPERIDAD	63	50
PROVINCIA DE EL ORO	10	102
PUERTO RICAN	65	142
PUERTO RICO	1	
PUNTA BRAVA	35	31
QUATSINO SOUND		74
QUEEN OPAL	85	22
QUINTINA	11	
RADIANT VENTURE	26	5
RAINBOW HOPE	1	167
RED ARROW	59	
REGENT CEDAR	33	9
REGINA MAERSK	43	121
RIGOLETTO	34	
ROACHBANK	118	
ROBERT D. CONRAD	38	98
ROBERT E. LEE	19	29
RODRIGUES CABRILHO	18	29
ROSE	2	128
ROSE CITY	8	
ROSINA TOPIC		209
ROVER	27	115
ROYAL SAPPHIRE	6	64
RUTH LYKES	20	
S.T. CRAPO	1	
SACRAMENTO	45	64
SAINT LOUIS	24	102
SALVADOR	17	32
SAM HOUSTON	8	23
SAMUEL S	32	7
SAN JUAN	107	156
SAN PEDRO	18	
SANKO DENEB		9
SANKO MAPLE	32	
SANTA JUANA	104	207
SANTA MAGDALENA	38	16
SANTA MARIA	37	83
SANTA MARIANA	30	25
SAUDI RIYADH	28	23
SAVONITA	37	91
SEA ASTRA	81	93
SEA BELLS		38
SEA DIAMOND		211
SEA EXPORTER	16	49
SEA FAN		130
SEA FORTUNE		56

SHIP NAME	VIA RADIO	VIA MAIL
SEA JADE	70	72
SEA LANTERN	29	80
SEA LIGHT		69
SEA WORLD	32	159
SEALAND ADVENTURER	79	176
SEALAND CONSUMER	40	124
SEALAND DEFENDER	55	155
SEALAND DEVELOPER	65	132
SEALAND ECONOMY	31	118
SEALAND ENDURANCE	50	153
SEALAND EXPLORER	55	152
SEALAND EXPRESS	27	182
SEALAND FREEDOM	50	132
SEALAND INDEPENDENCE	51	156
SEALAND INNOVATOR	78	136
SEALAND LEADER	70	131
SEALAND LIBERATOR	44	145
SEALAND MARINER	43	161
SEALAND PACER	40	175
SEALAND PATRIOT	51	164
SEALAND PIONEER	29	96
SEALAND PRODUCER	37	172
SEALAND VENTURE	74	136
SEALAND VOYAGER	63	111
SENATOR	33	36
SEVEN OCEAN	38	25
SHIRLEY LYKES	28	55
SKAUGRAN	51	139
SKODSBORG	8	5
SKOUBORD	43	142
SNOW CRYSTAL	23	
SOHIO INTREPID	37	109
SOHIO RESOLUTE	68	149
SOLON TURMAN	14	142
SOUTH LIGHT	22	
SOUTHERN ACCORD		58
SOUTHWEST CAPE	23	56
SOVEREIGN VENTURE	12	
SPARROWS POINT	132	158
SPIRIT OF LIBERTY	28	64
SPRING BALLAD	46	104
SPRING BIRD	27	92
SPRING BLOSSOM	64	133
ST. CLAIR		22
STAR CARRIER	10	3
STAR DIEPPE	57	
STAR DOVER	33	88
STAR ENTERPRISE	33	28
STAR LUZON	6	4
STAR MALAYSIA	21	
STAR PHILLIPPINES	5	
STAR SINGAPORE	10	
STAR THAILAND	16	47
STARWARD	52	34
STEADFAST	10	4
STELLA LYKES	21	48
STEWART J. CORT		110
STONEWALL JACKSON	27	
STREAM HAWSER	14	
SUGAR ISLANDER	17	20
SUN VIKING	37	105
SUNBELT DIXIE	153	208
SYLVO	18	38
TAI CORN	6	
TAIKO VENTURE	14	
TARASCO	60	186
TENCHBANK	124	
TEXACO GEORGIA	12	55
TEXAS CLIPPER	23	
TEXAS TRADER	99	154
TFL DEMOCRACY	29	128
TFL ENTERPRISE	27	120
TFL EXPRESS	49	130
TFL FRANKLIN	51	
TFL FREEDOM	30	169
TFL INDEPENDENCE	6	144
TFL JEFFERSON	30	49
TFL LIBERTY	24	156
THOMAS G. THOMPSON	100	96
THOMAS WASHINGTON	119	53
THOMPSON LYKES	11	25
THOMPSON PASS	11	
TILLIE LYKES	3	24
TOKYO RAINBOW	28	47
TONCI TOPIC	29	82
TONSONIA	8	49
TOWER BRIDGE	78	37
TOYOTA #24	97	24
TRANSCOLUMBIA	52	83
TRITON	40	189
TROPIC SUN	18	13
TUMILCO	67	
TYSON LYKES	63	141
ULTRAMAR	12	36
ULTRASEA	6	56
UNIVERSE	35	
USCGC ALERT (WMEC 630)	5	
USCGC BASSWOOD (WLB 38	29	35
USCGC BOUTWELL WMEC 71	17	
USCGC CHASE (WMEC 718)	4	
USCGC CHEROKEE WMEC 16	1	93
USCGC CHILULA (WMEC 15	2	127
USCGC CITRUS (WMEC 300	19	
USCGC CLOVER (WMEC 292	27	
USCGC CONFIDENCE	4	
USCGC COURAGEOUS	18	25
USCGC DEPENDABLE	20	
USCGC DUANE (WMEC 33)	94	41
USCGC DURABLE (WMEC 62	15	
USCGC EAGLE (WIX 327)	4	
USCGC FIREBUSH WLB 393	13	
USCGC INGHAM (WMEC 35)	21	12
USCGC IRONWOOD (WLB 29	12	
USCGC LAUREL (WLB 291)	24	63
USCGC LIPAN (WMEC 85)	46	143
USCGC MALLOW (WLB 396)	30	
USCGC MELLON (WHEC 717	20	
USCGC MIDGETT (WMEC 72	4	103
USCGC MUNRO (WMEC 724)		163
USCGC NORTHWIND WAGB 2	195	219
USCGC POLAR SEA WAGB 1	20	
USCGC POLAR STAR WAGB	15	29
USCGC RESOLUTE WMEC 62	35	
USCGC RUSH (WMEC 723)		56
USCGC SHERMAN (WHEC 72	92	55
USCGC STORIS (WMEC 38)	5	
USCGC SUNDEW (WLB 404)	23	59
USCGC SWEETBRIER WLB 4	23	
USCGC TANEY (WHEC 37)	5	
USCGC VALIANT (WMEC 62	7	
USCGC VIGOROUS WMEC 62	5	
USCGC YOCONA (WMEC 168	12	
USGS S.P. LEE	94	151
USNS ALGOL	3	
USNS APACHE	40	
USNS BARTLETT	67	175
USNS DE STEIGUER	64	91
USNS KANE TAGS 27		232
USNS LYNCH T-AGOR 7	43	146
USNS MAUMEE	43	134
USNS METEOR T-AKR 9	18	
USNS MISSISSINEWA		150
USNS MOHAWK	30	33
USNS NEOSHO T-AO-143		66
USNS PASSUMPSIC TAO 10		72
USNS PAWCATUCK TAO-108		162
USNS POWHATAN TATF 166	51	58
USNS RANGE SENTINEL	5	
USNS RIGEL TAF 58		34
USNS SEALIFT ANTARCTIC	12	
USNS SEALIFT ARABIAN S	1	2
USNS SEALIFT CHINA SEA	17	10
USNS SEALIFT MED	94	137
USNS SEALIFT PACIFIC	24	29
USNS SOUTHERN CROSS	36	54
USNS TRUCKEE TAO-147		95
USNS VANGUARD TAG 194	60	174
USNS WACCAMAW(TAO-109)		85
USNS YUKON T-AO 152	5	23
VALLEY FORGE		20
VALOR	14	
VAN CONQUEROR	51	159
VAN HAWK	48	
VELMA LYKES	23	
VENTURE STAR		18
WALCHAND	45	85
WALTER RICE	24	176
WASHINGTON RAINBOW #2		35
WASHINGTON TRADER	97	224
WECOMA	86	134
WESTERN SUN	9	5
WESTWARD		25
WESTWARD VENTURE	34	54
WILLIAM A. ROESCH		60
WILLIAM CLAY FORD	89	53
WILLIAM E. HUSSMAN	21	126
WINTER WATER	57	96
WOLVERINE		98
WOOD STAR	12	53
WORLD CANDOUR	50	18
WORLD PROBITY	9	3
YAMASHIN MARU	141	60
ZEPHUNTER	62	111
ZEUS	30	113
ZIM HONGKONG	18	
ZOELLA LYKES	17	38
3AGE2		21
3EAQ3		49
3EBR		8
3EFK		6
3EKJ2		132
3EPA	40	104
3ESG2		26
3EUD2		24
3EWL	74	42
3EWQ	40	197
3EXD2		17
3EXX2		67
3EZT2		50
3FDZ2		90
3FHO2		36
3FIQ2		55
3FNM2		33
3FPX2		37
3FUM		30
3HFN2		239
5HZH		18
5LOT		16
5LUB	58	306
5MYK	15	
5MZW		18
6ZRT	6	45
6ZTO	17	38
7JPU		30
7LDN	17	31
9VNW	1	
A8DD	1	36
A8PJ	20	71
ATJV	11	15
BHFK	54	52
BLHD		35
C6FA3		226
C5DB	38	99
D5DW	35	102
D5DZ	13	106
D5OD		23
D7QY	11	21
D7YL	16	42
D9OA		4
DUWZ		139
DZBR	35	69
DZGM	13	30
DZRL		21
DZSD		49
EAFG	9	87
ELAJ4		98
ELAN3		46
ELBG2		62
ELBM4		186
ELDE2		67
ELDS2		9
ELDU4		54
ELDV3		5
ELDV5		15
ELDW7		127
ELDX6		14
ELLK	53	128
ELN7		1
ELOC	8	16
ELRA	1	
ELTD7		26
ELVN	1	59
GZOW	103	132
H3XV	7	22
H8JO	27	55
H8JV		15
H8WR	6	27
H8YQ	13	13
H9KJ	8	46
HOEJ	10	52
HPOP	39	59
HPRL	1	94
HPVO	4	12
HSDF		2
IBES		14
JMGK	65	76
JZRV		60
KALD	9	43
KCBK	5	37
KEYE		5
KGSM		12
KGVK	9	86
KGYE	45	121
KHAG	2	13
KIUN		8
KLCH	1	31
KLCZ		7
KNTJ		5
KONF		32
KPED		19
KPXT	1	21
KRCJ	18	45

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U.S. NDBC Climatological Data

July, August and September 1984

JULY	1984		AIR TEMPERATURE (DEG C)							SEA TEMPERATURE (DEG C)							AIR-SEA TEMPERATURE DIFFERENCE (DEG C)						
BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	740	31	29.1	30 13	21.1	06 21	25.4	739	31	27.9	26 21	24.1	01 10	25.6	741	31	02.7	30 13	-04.1	06 21	-00.2
41002	32.3N	075.3W	740	31	28.0	28 20	22.5	20 18	26.2	740	31	28.3	24 19	25.1	01 00	26.7	740	31	00.7	18 15	-04.2	20 18	-00.5
41006	29.3N	077.3W	742	31	28.8	10 18	22.9	21 19	27.2	743	31	29.5	09 21	27.2	05 07	28.1	743	31	00.1	10 18	-05.2	21 19	-00.9
42001	25.9N	089.7W	203	22	28.4	05 18	21.2	31 15	26.2	286	22	30.9	08 21	28.5	23 12	29.3	286	22	-01.1	03 12	-07.7	31 15	-03.1
42002	26.0N	093.5W	247	31	30.1	21 18	24.5	14 21	28.0	247	31	31.7	16 21	28.2	24 09	29.3	247	31	00.1	10 15	-05.4	19 21	-01.4
42003	26.0N	085.9W	739	31	28.3	19 14	22.9	29 20	26.9	742	31	30.8	15 21	27.4	06 11	28.8	742	31	00.0	29 04	-05.4	11 21	-01.9
42007	30.1N	088.9W	730	31	31.3	20 21	21.9	18 22	27.4	732	31	30.5	11 21	24.9	02 12	28.3	733	31	02.1	20 21	-04.8	18 22	-00.9
42008	28.7N	095.3W	665	29	30.8	27 19	23.6	22 20	28.0														
42009	29.3N	087.5W	737	31	31.4	11 17	21.5	30 11	26.9	727	31	31.6	10 17	27.0	01 14	28.8	741	31	00.6	11 16	-06.4	30 11	-01.9
42011	29.6N	093.5W	739	31	31.5	08 16	22.1	01 13	27.9														
44005	42.7N	068.3W	740	31	21.4	24 20	13.6	01 11	18.0	740	31	21.0	26 20	12.7	01 11	17.0	740	31	03.7	06 08	-03.2	28 15	01.0
44007	43.5N	070.1W	715	31	25.3	13 00	12.8	09 09	17.4	327	15	19.8	29 20	13.7	24 14	16.4	326	15	09.9	24 16	-02.4	27 23	01.2
44008	40.5N	069.4W	736	31	22.6	22 16	13.8	01 14	18.9	736	31	20.3	27 00	10.7	19 01	16.1	738	31	09.5	22 16	-04.5	30 09	02.8
44009	38.5N	074.6W	729	31	24.9	24 23	16.2	08 14	20.9	731	31	22.9	12 22	15.1	07 12	19.8	739	31	04.6	24 23	-01.9	28 20	01.2
44010	36.9N	075.7W	741	31	28.5	24 20	16.5	08 11	22.2	741	31	24.9	24 22	15.0	07 05	21.1	741	31	08.3	12 03	-02.7	28 18	01.1
44011	41.1N	066.6W	739	31	21.2	19 02	13.8	01 13	17.9	739	31	19.9	14 17	12.6	01 13	15.7	740	31	06.0	08 13	-01.7	14 13	02.2
44012	38.8N	074.6W	739	31	25.2	26 16	15.9	08 13	20.9	737	31	22.6	02 19	14.8	06 15	19.5	740	31	05.9	06 20	-02.0	28 11	01.4
45001	48.0N	087.6W	737	31	14.4	23 03	03.6	14 05	07.1	741	31	08.4	27 23	03.2	01 06	04.1	742	31	10.2	23 03	00.1	14 05	03.0
45002	45.3N	086.3W	739	31	20.9	21 00	10.6	07 05	15.6	739	31	19.2	30 23	07.5	01 14	14.0	739	31	07.9	01 01	-02.1	27 14	01.6
45003	45.3N	082.8W	741	31	19.1	23 22	08.5	08 09	14.0	741	31	16.6	30 21	06.1	01 00	11.6	741	31	07.7	02 01	00.1	25 18	02.4
45004	47.2N	086.5W	736	31	14.4	29 00	03.8	20 07	07.3	739	31	07.4	29 21	03.0	01 06	03.8	739	31	09.0	29 00	00.2	20 07	03.4
45005	41.7N	082.5W	743	31	26.9	03 22	15.5	07 13	21.9	743	31	25.3	15 00	20.3	01 11	22.3	743	31	04.5	10 23	-05.0	07 13	-00.5
45006	47.3N	090.0W	720	31	19.4	30 01	05.4	14 04	10.4	723	31	14.1	31 23	03.4	01 09	06.4	724	31	11.5	13 00	00.1	29 09	04.1
45007	42.7N	087.1W	741	31	23.1	31 00	11.6	01 06	18.3	741	31	22.4	30 20	09.9	01 07	16.8	741	31	06.4	10 12	-01.7	26 16	01.5
45008	44.3N	082.4W	738	31	22.2	23 20	11.0	07 11	16.9	736	31	19.9	29 23	10.9	01 10	15.5	738	31	05.7	23 20	-01.6	18 17	01.5
46001	56.3N	148.3W	740	31	14.4	07 19	09.3	01 21	12.0														
46002	42.5N	130.3W	739	31	17.6	28 22	12.3	04 15	14.4	739	31	18.2	29 01	14.5	03 13	15.4	739	31	00.6	28 23	-02.7	04 10	-00.9
46003	51.9N	155.7W	741	31	12.5	29 04	08.8	01 04	10.9	741	31	12.4	25 02	09.1	01 13	11.1	741	31	00.9	03 21	-01.9	12 14	-00.2
46004	51.0N	136.0W	744	31	13.9	29 23	09.3	03 19	11.8	744	31	13.9	23 00	10.4	01 01	12.3	744	31	00.6	29 23	-02.1	03 19	-00.5
46005	46.1N	131.0W	529	23	16.2	27 21	11.1	20 02	13.4	740	31	16.0	28 00	12.4	01 16	13.9	529	23	01.2	27 21	-03.1	20 02	-00.9
46006	40.7N	137.7W	742	31	19.0	29 05	13.2	22 13	16.2	742	31	19.8	31 00	15.9	01 13	18.1	742	31	-00.1	12 02	-05.4	22 13	-02.0
46011	34.9N	120.9W	742	31	18.4	19 22	11.9	02 10	15.1	742	31	19.1	19 22	12.9	02 16	16.2	742	31	01.0	26 22	-02.9	11 16	-01.1
46012	37.4N	122.7W	731	31	17.2	13 22	11.9	10 14	14.4	738	31	17.1	02 01	12.0	03 04	14.4	739	31	02.6	14 22	-03.3	30 11	00.0
46013	38.2N	123.3W	736	31	16.5	17 02	09.6	30 15	12.7	736	31	15.4	24 20	09.3	01 14	12.1	734	31	03.9	15 01	-02.4	25 13	00.6
46014	39.2N	124.0W	741	31	17.2	15 20	09.6	04 08	12.4	738	31	15.4	16 08	09.7	12 11	12.2	741	31	03.3	17 01	-02.9	30 19	00.1
46016	63.3N	170.3W	189	24	14.5	14 03	02.5	11 12	07.0														
46017	60.3N	172.3W	247	31	10.0	13 21	03.4	07 15	06.3														
46022	40.8N	124.5W	741	31	15.8	25 23	09.6	22 14	12.2	741	31	13.7	26 00	09.4	19 11	11.5	741	31	03.1	04 03	-01.2	10 14	00.7
46023	34.3N	120.7W	742	31	18.0	18 22	12.5	02 12	15.2	742	31	19.1	18 22	14.2	07 14	16.9	742	31	00.3	06 20	-02.9	02 12	-01.3
46024	32.8N	119.5W	742	31	18.5	16 00	14.0	01 10	16.6	742	31	20.2	18 22	16.3	01 12	18.3	742	31	-00.2	26 16	-03.2	30 11	-01.7
46025	33.6N	119.0W	743	31	22.8	27 02	15.4	02 07	19.0	743	31	23.9	29 19	18.4	08 13	21.0	743	31	00.4	26 01	-04.8	02 08	-02.0
46026	37.8N	122.7W	741	31	19.4	14 22	10.2	10 14	13.6	741	31	17.1	14 00	10.4	01 06	14.7	741	31	03.0	01 23	-04.1	30 12	-01.1
46027	41.8N	124.4W	738	31	14.1	25 21	08.6	05 12	10.8	733	31	13.6	25 23	07.4	01 13	09.5	738	31	05.5	04 03	-01.2	26 14	01.4
46028	35.8N	121.7W	740	31	16.8	14 00	11.8	11 08	14.5	740	31	17.1	20 23	11.5	01 00	15.2	740	31	02.2	02 01	-02.7	30 15	-00.7
46029	46.2N	124.2W	739	31	17.0	22 20	09.3	23 09	13.2	740	31	16.7	01 22	09.3	22 15	12.8	740	31	04.0	22 17	-02.6	01 00	00.4
51001	23.4N	162.3W	466	31	27.1	10 04	24.0	22 07	25.9	466	31	28.0	12 01	26.0	01 13	26.7	466	31	00.0	22 22	-03.5	12 04	-00.8
BURL1	28.9N	089.4W	426	19	31.1	27 17	23.2	23 09	27.0														
CSBF1	29.7N	085.4W	735	31	29.9	14 17	20.9	30 09	26.4														
DBLN6	42.6N	079.5W	736	31	27.5	15 21	11.6	08 10	20.5														
DISW3	47.1N	090.7W	739	31	27.2	20 22	08.6	06 10	16.7														
FBIS1	32.7N	079.9W	741	31	29.8	07 16	20.4	29 07	26.0														
FFIA2	57.3N	133.6W	309	13	17.5	23 21	09.2	19 13	13.0														
GLLN6	43.5N	076.3W	739	31	26.0	22 22	13.8	08 07	19.4														
LKWF1	26.7N	080.0W	162	08	35.0	25 09	22.2	22 08	27.3	146	07	33.1	24 22	27.5	26 07	28.6	251	11	03.0	25 09	-05.7	22 08	-00.7
NWPO3	44.6N	124.1W	734	31	15.2	27 00	08.4	22 09	11.2														
PILM4	48.2N	088.4W	699	31	18.0	30 01	04.8	06 05	11.0														
PTAT2	27.8N	097.1W	740	31	28.6	31 23	23.6	30 08	27.2														
PTGC1	34.6N	120.7W	736	31	18.9	18 23	11.2	01 12	14.5														
ROAM4	47.9N	089.3W	737	31	19.0	24 04	06.1	10 13	11.4														
SBIO1	41.7N	082.8W	740	31	32.2	14 19	15.3	07 10	22.0														
SGNW3	43.8N	087.7W	741	31	29.8	23 17	10.6	07 10	18.7														
SISW1	48.3N	122.9W	725	31	22.9	23 23	09.3	03 10	13.0														
SJLF1	30.4N	081.4W	735	31	33.8	12 17	19.9	02 23	25.8														
SRST2	29.7N	094.1W	736	31	31.9	23 18	21.4	19 11	27.3														
STDM4	47.2N	087.2W	367	16	20.5	29 21	06.3	17 18	12.8														
WPOW1	47.7N	122.4W	740	31	23.8	24 02	10.5	11 13	15.0														

JULY	1984		PRESSURE (MB)							WIND SPEEDS (KNOTS)				MEAN WIND SPEED (KNOTS)								
BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	MAX	DY HR	DIR	N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	740	31	1025.4	23 16	1013.0	12 08	1020.0	726	35	19 19	240	10.4	9.2	4.2	8.0	14.6	16.2	12.9	6.8	14.3
41002	32.3N	075.3W	740	31	1024.2	14 16	1014.9	12 08	1019.6	735	22	19 15	290	7.3	8.2	7.6	10.8	10.9	10.5	8.9	7.0	10.4
41006	29.3N	077.3W	743	31	1024.1	14 16	1015.5	12 00	1019.3	737	23	22 13	240	4.5	6.1	7.6	9.2	9.6	8.9	6.3	6.2	08.8
42001	25.9N	089.7W	203	22	1020.2	03 15	1012.0	31 00	1016.0	203	25	31 19	120	6.0	7.1	10.0	11.7	9.5	7.2	6.0	13.7	10.1
42002	26.0N	093.5W	247	31	1021.3	15 18	1011.2	31 00	1016.0	242	27	14 18	180	8.0	7.4	8.0	8.9	8.5	4.9	4.3	6.4	08.0
42003	26.0N	085.9W	742	31	1021.7	14 16	1012.7	31 10	1016.6	729	26	17 13	190	6.4	7.8	8.8	9.3	9.0	8.8	5.8	8.6	08.6
42007	30.1N	088.9W	732	31	1022.2	14 16	1011.8	17 23	1016.6	716	32	19 03	040	6.9	7.4	8.8	7.2	7.0	7.3	7.1	7.2	07.3
42008	28.7N	095.3W	668	29	1021.0	15 15	1009.4	01 00	1015.7	669	30	01 21	120	8.6	9.4	8.8	9.6	10.8	11.3	8.5	8.5	10.1
42009	29.3N	087.5W	740	31	1021.8	14 16	1011.5	01 00	1016.0	673	24	23 06	050	5.6	7.7	6.8	7.7	7.4	7.6	6.8	7.1	07.2
42011	29.6N	093.5W	739	31	1021.2	15 15	1010.2	01 01	1015.9	732	29	01 12	280	8.0	11.4	9.1	8.3	9.1	10.8	10.8	7.6	09.6
44005	42.7N	068.3W	740	31	1025.2	29 16	1000.3	12 09	1014.7	736	27	27 23	110	9.0	3.8	13.5	5.7	10.8	9.8	7.2	9.2	09.5
44007	43.5N	070.1W	717	31	1025.2	29 15	997.9	12 09	1013.6	698	20	07 07	190	6.6	8.2	5.4	7.0	10.8	9.5	7.0	7.8	09.2
44008	40.5N	069.4W	737	31	1025.1	29 15	1003.0	12 08	1016.0	732	22	07 19	210	7.8	6.8	7.5	7.4	10.8	9.6	7.6	7.1	09.2
44009	38.5N	074.6W	730	31	1024.1	29 17	1005.7	18 15	1016.9	731	25	06 00	180	8.0	10.9	5.8	7.8	12.5	10.9	5.8	8.8	10.3
44010	36.9N	075.7W	741	31	1023.9	31 16	1008.5	18 14	1017.3													
44011	41.1N	066.6W	739	31	1025.7	22 00	1004.3	12 14	1016.8	731	24	08 20	160	7.3	7.7	5.3	8.5	8.6	8.5	6.9	6.1	08.1
44012	38.8N	074.6W	736	31	1024.0	29 15	1004.5	18 15	1015.9	736	28	05 15	210	7.4	7.8	8.4	5.5	12.3	11.9	7.6	6.7	10.2
45001	48.0N	087.6W	741	31	1026.7	28 16	1001.7	17 09	1013.6	732	15	06 12	330	6.6	4.1	6.1	6.9	7.0	7.8	7.5	7.0	07.3
45002	45.3N	086.3W	739	31	1025.6	28 17	1001.2	17 11	1014.1	719	20	14 22	190	7.2	4.3	3.4	5.1	9.9	9.3	7.2	9.8	08.6
45003	45.3N	082.8W	741	31	1026.9	29 15	1001.5	17 16	1013.9	728	18	06 20	300	6.0	6.5	4.3	6.5	7.8	6.6	8.2	7.3	07.3
45004	47.2N	086.5W	739	31	1026.9	28 17	1002.0	17 12	1014.1	715	19	06 16	310	4.4	4.6	4.3	6.3	6.3	6.1	6.7	6.9	06.3
45005	41.7N	082.5W	743	31	1026.5	29 16	1004.1	11 11	1015.6	720	14	05 22	300	4.8	4.6	3.3	3.2	3.7	5.0	4.8	6.0	04.6
45006	47.3N	090.0W	723	31	1027.7	24 16	1003.9	17 09	1014.4	709	16	22 23	220	6.1	5.7	5.9	6.3	7.8	7.9	8.1	6.8	07.3
45007	42.7N	087.1W	741	31	1027.5	29 15	1004.0	11 01	1015.7	713	21	23 23	340	7.0	6.1	7.4	5.9	7.7	6.7	6.2	8.9	07.2
45008	44.3N	082.4W	738	31	1027.2	29 14	1000.0	11 09	1014.4	732	22	11 09	250	6.3	6.8	4.3	4.7	7.3	6.7	8.0	7.7	06.9
46001	56.3N	148.3W	740	31	1025.6	21 01	999.7	16 03	1013.5	731	25	16 01	350	9.8	9.3	8.2	8.1	7.4	7.6	9.1	9.2	08.5
46002	42.5N	130.3W	739	31	1027.0	20 21	1015.5	23 02	1022.3	717	22	23 04	350	14.0	9.6	2.2	5.0	5.1	4.9	6.4	9.5	11.6
46003	51.9N	155.7W	741	31	1032.1	04 20	1001.8	27 13	1018.0	740	23	28 05	350	15.0	3.7	18.0	15.2	9.8	12.5	12.1	11.5	12.2
46004	51.0N	136.0W	744	31	1030.1	16 22	1011.2	01 00	1020.4	741	22	18 23	230	8.2		4.0	11.1	10.0	10.5	10.0	8.7	10.0
46005	46.1N	131.0W	740	31	1029.4	16 19	1013.8	26 04	1023.1	517	28	25 16	350	15.1	10.1		2.7	10.2	7.7	9.0	10.8	11.6
46006	40.7N	137.7W	742	31	1030.1	21 19	1020.9	27 13	1025.4	742	21	05 09	040	12.1	12.4	11.3	10.1	9.0	9.6	9.3	8.1	10.5
46011	34.9N	120.9W	742	31	1020.6	24 20	1007.4	07 01	1013.6	723	26	26 02	320	6.9	2.7		7.0	5.6	4.3	4.3	10.4	08.9
46012	37.4N	122.7W	732	31	1021.3	25 06	1006.1	13 12	1013.3	735	22	09 14	330	10.4	5.0	3.9	6.6	7.5	4.8	5.3	10.9	08.9
46013	38.2N	123.3W	736	31	1022.7	25 18	1006.6	07 03	1014.0	695	29	28 02	300	3.9	2.6	3.0	5.0	4.1	3.5	10.1	15.7	11.3
46014	39.2N	124.0W	741	31	1021.8	25 19	1005.8	06 05	1013.2	687	27	06 05	330	12.1	4.1	2.1	3.3	4.9	4.0	3.6	15.6	12.4
46016	63.3N	170.3W	189	24	1022.3	15 12	1004.3	06 09	1013.4	189	26	07 00	260	10.4	15.7	12.0	5.2	11.8	12.6	12.0	8.4	11.8
46017	60.3N	172.3W	247	31	1024.9	15 09	994.3	30 21	1014.3	247	23	17 06	260	11.7	9.2		1.0	15.8	11.3	11.3	6.7	11.4
46022	40.8N	124.5W	741	31	1022.5	25 19	1008.4	22 13	1015.6	731	26	12 12	350	13.0	4.1	2.0	2.6	6.7	8.5	4.1	10.0	11.7
46023	34.3N	120.7W	742	31	1020.9	24 20	1007.0	07 02	1013.4	734	31	25 11	320	17.3	4.7		4.2	3.5	4.5	7.4	17.0	15.3
46024	32.8N	119.5W	742	31	1020.0	24 19	1007.1	06 04	1012.9	741	21	25 07	310	2.7	2.0				5.4	9.0	10.7	09.9
46025	33.6N	119.0W	743	31	1018.4	24 19	1005.6	06 02	1011.6	719	16	25 03	290	3.1	1.6	2.5	4.1	3.6	4.1	7.1	5.3	06.0
46026	37.8N	122.7W	741	31	1021.7	25 06	1006.9	13 12	1013.7	723	21	09 13	310	2.0	1.0	2.8	3.3	6.2	5.0	9.3	12.4	08.1
46027	41.8N	124.4W	738	31	1023.6	25 19	1007.6	22 01	1015.8	739	39	02 00	290	3.4	2.2	6.9	7.1	2.3	1.0	16.3	19.7	16.7
46028	35.8N	121.7W	740	31	1021.7	24 19	1007.4	07 02	1014.2	718	26	26 05	310	4.1		1.0	4.7	3.9	2.5	4.4	13.2	10.0
46029	46.2N	124.2W	740	31	1025.6	19 20	1010.1	23 01	1019.8	721	28	25 08	170	11.0	4.7	2.8	5.0	11.1	3.6	4.3	8.6	10.0
51001	23.4N	162.3W	466	31	1021.2	29 10	1013.6	11 04	1017.3	464	19	22 07	140	2.0	10.8	10.6	9.0	3.6	3.7		2.0	10.1
BURL1	28.9N	089.4W	340	18	1019.7	26 15	1011.5	17 20	1015.3	426	30	23 09	360	9.1	7.8	6.7	5.7	7.1	9.1	6.1	4.3	06.7
CSBF1	29.7N	085.4W	743	31	1022.6	14 16	1012.9	01 00	1017.5	743	20	18 10	210	2.8	2.6	4.7	4.0	6.5	7.1	4.4	2.4	05.3
DBLN6	42.6N	079.5W	736	31	1026.6	29 13	1003.3	11 19	1015.6	736	24	11 18	240	3.9	6.5	4.6	4.6	4.3	9.8	9.6	8.3	07.4
DISW3	47.1N	090.7W	737	31	1027.2	24 17	1004.3	17 08	1013.8	737	21	13 10	310	6.6	6.3	5.9	6.0	6.9	11.0	9.0	8.8	08.7
FBIS1	32.7N	079.9W	740	31	1022.6	24 13	1011.0	01 00	1017.7	741	25	18 09	220	5.6	9.8	11.9	7.8	8.9	12.0	5.3	3.8	09.6
FFIA2	57.3N	133.6W	309	13	1023.5	25 04	1014.0	27 04	1019.4	309	16	26 07	350	5.0	2.5	2.6	4.1	4.8	2.9	2.3	2.3	03.5
GLLN6	43.5N	076.3W	739	31	1026.2	29 15	999.1	11 21	1014.2	739	20	18 05	300	5.9	5.4	5.2	7.9	8.6	8.9	12.5	9.9	09.5
LKWF1	26.7N	080.0W	264	12	1020.7	24 15	1014.7	22 10	1017.9	265	21	23 17	140	2.0	4.0	10.6	11.3	10.9	3.7	3.2	4.8	10.3
NWPO3	44.6N	124.1W	735	31	1024.0	19 17	1008.7	22 12	1019.1	733	31	17 03	360	12.7	2.7	3.4	2.5	12.0	5.9	2.7	6.3	10.8
PILM4	48.2N	088.4W	739	31	1026.0	24 14	1001.9	17 08	1013.3	737	29	23 02	220	6.9	9.2	6.2	7.3	10.5	12.9	13.0	7.5	10.8
PTAT2	27.8N	097.1W	740	31	1021.3	15 16	1007.5	01 00	1015.2	739	22	01 07	150	9.0	11.3	9.4	10.5	9.2	5.1	5.0	5.3	09.0
PTGC1	34.6N	120.7W	512	22	1020.5	24 19	1007.3	13 02	1014.1	736	28	10 02	360	15.0	8.5	6.0	2.9	7.9	3.7	2.8	8.3	13.8
ROAM4	47.9N	089.3W	738	31	1027.0	24 14	1002.8	17 09	1013.9	735	35	16 01	320	10.2	10.2	4.7	12.5	10.1	12.9	15.2	11.9	12.6
SBIO1	41.7N	082.8W	741	31	1024.8	29 16	1004.3	11 10	1015.2	737	27	11 19	310	4.3	4.8	4.8	5.7	8.5	8.8	9.0	11.9	07.5
SGNW3	43.8N	087.7W	741	31	1027.8	29 14	1003.2	11 01	1015.3	741	24	19 21	180	7.8	5.0	4.0	5.6	11.0	7.8	9.7	10.6	08.9
SISW1	48.3N	122.9W	722	31	1024.4	02 19	1012.4	23 01	1019.0	722	26	06 05	270	2.8	1.6		2.8	6.9	10.0	10.3	5.4	09.6
SJLF1	30.4N	081.4W	734	31	1023.1	14 16	1012.8	01 00	1018.2	735	22	03 22	180	4.1	8.6	8.3	9.3	9.4	4.9	4.3	4.0	07.5
SRST2	29.7N	094.1W	736	31	1021.6	14 17	1009.5	01 01	1016.3	736	24	01 17	180	4.3	7.5	8.8	8.3	9.7	10.4	6.9	4.1	08.6
STDM4	47.2N	087.2W	369	16	1027.4	28 17	1001.5	17 13	1017.8	366	32	22 22	180	12.3	6.1	7.3	14.4	17.2	12.3	12.9	11.4	12.9
WPOW1	47.7N	122.4W	741	31	1023.6	02 18	1011.3	23 01	1018.5	741	20	25 16	180	6.4	5.6	2.1	3.5	6.8	5.2	8.6	2.8	05.8

JULY 1984			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)							
BUOY	LAT	LONG	OBS	MAX	DY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	733	4.0	01	01	1.4	5.8	74.8	12.5	4.6	0.1			
41006	29.3N	077.3W	738	2.0	06	21	1.1	0.8	98.7	0.4					
42001	25.9N	089.7W	186	2.0	30	05	0.7	67.2	30.6	2.1					
42002	26.0N	093.5W	237	1.5	11	03	0.6	64.8	35.4						
42003	26.0N	085.9W	726	1.5	28	15	0.6	71.7	28.2						
42007	30.1N	088.9W	302	1.5	23	22	0.5	84.7	15.2						
44005	42.7N	068.3W	738	3.0	06	04	1.2	17.4	65.5	15.9	0.9				
44007	43.5N	070.1W	299	2.0	28	03	0.7	65.8	33.1	1.0					
44008	40.5N	069.4W	705	3.5	19	02	1.2	23.8	56.1	19.0	0.9				
44010	36.9N	075.7W	727	1.5	01	01	0.7	54.1	45.8						
44011	41.1N	066.6W	735	3.5	08	20	1.4	14.2	55.6	24.6	5.4				
44012	38.8N	074.6W	123	0.0	00	00	0.0								60.1
45001	48.0N	087.6W	476	1.5	06	11	0.6	81.9	18.0						
45002	45.3N	086.3W	568	2.0	07	00	0.7	63.3	35.0	1.5					
45004	47.2N	086.5W	337	3.0	06	18	0.8	66.0	11.5	1.4	0.8				
45005	41.7N	082.5W	387	2.0	27	04	0.5	85.7	13.4	0.7					
45006	47.3N	090.0W	391	1.5	15	15	0.6	86.4	13.5						
45007	42.7N	087.1W	473	1.5	09	11	0.6	75.4	24.5						
45008	44.3N	082.4W	490	2.0	07	01	0.6	75.3	21.0	3.6					
46001	56.3N	148.3W	739	4.5	16	02	1.3	9.3	69.2	19.0	2.0	0.2			
46003	51.9N	155.7W	718	3.0	01	00	1.4	7.2	64.9	27.2	0.5				
46004	51.0N	136.0W	739	3.5	01	03	1.5	0.2	72.8	22.4	4.4				
46005	46.1N	131.0W	738	3.0	01	08	1.2	10.7	76.1	10.0	3.1				
46006	40.7N	137.7W	738	2.5	01	05	1.2	2.3	88.0	9.6					
46012	37.4N	122.7W	725	3.0	01	00	1.5	1.5	59.7	37.7	0.9				
46013	38.2N	123.3W	728	3.5	01	00	1.9		48.2	36.8	14.8				
46014	39.2N	124.0W	738	3.5	01	03	1.9	1.9	38.0	49.7	10.2				
46022	40.8N	124.5W	739	4.5	14	05	2.2	2.8	31.6	29.6	30.5	5.2			
46023	34.3N	120.7W	738	3.0	01	00	1.7		48.1	49.5	2.3				
46024	32.8N	119.5W	736	3.0	01	01	1.7		47.8	51.0	1.0				
46025	33.6N	119.0W	735	2.0	01	05	0.9	20.6	79.1	0.1					
46026	37.8N	122.7W	736	2.5	01	01	1.3	7.2	76.7	16.0					
46028	35.8N	121.7W	738	3.5	01	00	1.9		37.9	51.0	10.9				
46029	46.2N	124.2W	735	3.0	02	11	1.2	14.0	68.7	14.9	0.2				
51001	23.4N	162.3W	466	2.5	22	10	1.4		66.9	33.0					

JULY 1984			TOTAL FREQUENCY OF WIND SPEEDS (%)						TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY	LAT	LONG	CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		4.0	28.2	46.8	8.8	0.1		4.1	2.0	1.4	2.3	25.8	46.1	14.9	3.4
41002	32.3N	075.3W		4.8	44.4	50.5	0.1			1.5	6.3	2.2	20.9	34.1	31.8	2.8	0.4
41006	29.3N	077.3W		4.7	66.4	28.8	0.1			1.4	2.3	13.1	33.5	31.3	11.0	5.2	1.9
42001	25.9N	089.7W		4.4	57.6	36.0	2.0			0.4	9.0	32.8	33.4	19.0	3.4	1.2	0.7
42002	26.0N	093.5W		12.4	62.4	24.8	0.4			0.6	5.1	26.7	40.0	13.7	8.7	3.3	2.0
42003	26.0N	085.9W		12.5	56.1	30.9	0.5			5.7	14.3	36.7	21.1	12.8	3.8	3.2	2.6
42007	30.1N	088.9W		13.0	71.9	14.7	0.4			8.2	5.0	10.2	17.1	24.5	16.3	11.6	7.1
42008	28.7N	095.3W		5.2	51.9	41.7	1.2			3.9	3.7	9.7	28.6	40.7	11.5	1.3	0.6
42009	29.3N	087.5W		15.0	66.6	18.1	0.3			4.2	6.2	12.7	26.4	21.0	15.5	8.8	5.3
42011	29.6N	093.5W	2.2	6.7	51.2	41.8	0.3			4.1	11.0	8.8	10.2	27.3	29.5	8.0	1.9
44005	42.7N	068.3W		8.8	51.2	38.9	0.7			1.3	0.4	2.8	3.7	22.7	51.9	11.8	6.2
44007	43.5N	070.1W		8.3	53.0	38.7				4.7	3.8	1.4	2.9	27.3	44.3	10.2	5.4
44008	40.5N	069.4W		9.2	54.8	35.9	0.1			5.0	5.9	4.2	6.2	26.8	41.2	9.2	3.4
44009	38.5N	074.6W	3.3	6.3	51.7	39.9	2.1			9.0	7.3	2.6	4.4	30.7	30.5	6.7	8.8
44011	41.1N	066.6W		11.4	63.2	25.2	0.3			4.4	3.3	1.7	7.4	24.7	43.8	10.7	4.0
44012	38.8N	074.6W	3.8	4.2	53.7	37.5	2.3			5.0	9.3	7.1	3.8	19.4	39.8	9.4	5.9
45001	48.0N	087.6W		8.9	81.7	9.4				4.0	2.1	3.2	6.0	16.8	34.4	21.1	12.3
45002	45.3N	086.3W		10.8	58.4	30.7				11.6	3.3	2.8	3.2	31.7	26.3	10.1	11.1
45003	45.3N	082.8W		12.1	70.7	17.2				4.4	3.5	2.4	7.8	21.9	17.4	25.3	17.3
45004	47.2N	086.5W		14.1	79.4	6.3				3.0	2.0	3.6	7.8	18.0	26.9	22.7	16.0
45005	41.7N	082.5W		39.3	54.7	1.0				6.9	10.3	8.2	7.6	11.2	26.4	17.9	9.4
45006	47.3N	090.0W		7.8	82.1	10.2				5.0	5.0	4.3	5.8	13.2	32.5	24.9	9.4
45007	42.7N	087.1W		12.6	71.8	15.6				14.5	6.5	4.0	8.1	31.7	14.1	9.2	11.9
45008	44.3N	082.4W		15.8	71.3	12.7	0.1			10.3	5.7	2.9	6.7	28.4	21.6	12.8	11.4
46001	56.3N	148.3W		10.1	60.9	28.5	0.5			7.7	6.4	12.1	14.5	14.7	10.5	21.9	12.1
46002	42.5N	130.3W		4.3	35.1	40.4	0.1			55.8	3.1	0.6	0.9	1.5	1.0	7.8	29.2
46003	51.9N	155.7W		0.9	35.1	42.7	1.2			4.8	0.2	0.2	5.2	4.6	10.8	58.3	15.9
46004	51.0N	136.0W		3.6	46.4	49.8	0.1			0.8		0.4	8.1	18.0	35.7	23.8	13.2
46005	46.1N	131.0W		4.8	40.8	51.3	3.1			38.4	3.0		0.7	9.4	7.7	19.5	22.3
46006	40.7N	137.7W		5.0	47.8	47.2				16.7	29.8	5.5	3.0	2.4	8.9	18.9	15.7
46011	34.9N	120.9W		11.6	57.4	29.0	1.9			12.9	2.3		<.05	1.9	3.4	10.8	70.6
46012	37.4N	122.7W		11.7	52.9	35.2	0.1			9.4	0.2	0.2	3.5	23.0	9.4	8.0	46.3
46013	38.2N	123.3W		20.0	34.8	29.8	15.4			1.3	0.8	2.1	10.8	9.7	3.9	20.5	51.0
46014	39.2N	124.0W		13.2	29.4	43.1	14.3			22.3	0.6	1.7	3.2	8.6	3.2	3.4	57.0
46016	63.3N	170.3W		4.2	38.6	54.0	3.2			5.4	11.2	15.1	0.7	2.0	18.7	30.0	16.9
46017	60.3N	172.3W		6.5	35.2	56.7	1.6			18.4	1.3		0.4	3.3	47.9	27.6	1.0
46022	40.8N	124.5W		4.4	38.0	55.0	2.6			71.3	1.7	0.3	0.6	3.2	3.6	2.0	17.3
46023	34.3N	120.7W		5.0	17.8	59.9	17.2			7.9	0.4		1.1	1.3	2.1	11.6	75.6
46024	32.8N	119.5W		4.2	55.7	40.1				0.4	<.05				0.5	48.2	51.8
46025	33.6N	119.0W		23.5	66.8	9.7				1.3	0.3	1.0	3.2	7.8	14.6	62.4	9.5
46026	37.8N	122.7W		14.0	58.9	27.1				0.4	0.1	0.9	2.5	16.9	21.8	40.9	16.5
46027	41.8N	124.4W	6.6	9.5	28.8	22.5	33.8	5.4		1.3	1.0	3.2	6.2	2.5	2.2	18.6	65.0
46028	35.8N	121.7W		19.2	35.5	40.5	4.7			0.5		0.2	4.2	9.8	5.2	15.1	65.0
46029	46.2N	124.2W		7.9	44.9	46.9	0.3			68.9	1.5	0.6	2.0	6.6	1.8	3.4	15.3
51001	23.4N	162.3W		2.6	46.6	50.9				0.3	7.5	77.6	9.7	3.1	1.6		0.1
BURL1	28.9N	089.4W	4.0	19.5	65.7	14.6	0.2			5.1	12.3	26.8	25.5	10.7	8.6	7.3	3.8
CSBF1	29.7N	085.4W	8.2	29.7	62.9	7.0				1.8	10.1	11.1	16.4	30.2	18.2	9.5	2.5
DBLN1	42.6N	079.5W	3.0	17.8	58.3	23.2	0.7			5.4	4.8	2.3	11.2	22.8	33.1	15.8	4.7
DISW3	47.1N	090.7W	2.6	10.3	56.3	33.4				5.2	8.1	6.1	7.0	18.6	42.6	6.8	5.8
FBIS1	32.7N	079.9W	1.8	11.7	44.8	42.8	0.7			3.7	3.9	7.2	6.6	14.1	45.9	14.9	3.7
FFIA2	57.3N	133.6W	21.7	61.5	31.4	7.1				26.9	16.4	2.8	7.6	9.1	12.9	13.7	10.4
GLLN6	43.5N	076.3W	3.4	10.7	47.8	41.0	0.5			3.5	4.2	1.5	4.1	22.9	32.3	26.1	5.4
LKWF1	26.7N	080.0W	1.9	6.0	40.4	53.2				1.4	2.3	23.6	54.9	11.2	2.4	2.3	1.6
NWP03	44.6N	124.1W	5.3	16.0	34.2	43.1	6.7			72.7	5.0	4.2	0.8	4.3	4.3	0.7	8.0
PILM4	48.2N	088.4W	1.4	6.6	44.9	46.0	2.4			4.2	4.2	5.5	6.4	20.3	32.5	18.7	6.2
PTAT2	27.8N	097.1W	2.3	4.1	46.4	47.4	0.1			3.1	6.3	19.5	47.7	20.2	2.8	0.8	0.7
PTGC1	34.6N	120.7W	1.4	6.5	23.4	59.2	10.9			84.2	0.4	0.2	0.6	4.4	4.4	1.2	0.1
ROAM4	47.9N	089.3W	1.9	7.1	35.2	46.3	11.3	0.1		10.4	8.6	1.4	3.0	9.4	27.9	30.3	9.0
SBIO1	41.7N	082.8W	3.9	22.1	50.2	27.0	0.7			5.7	9.2	11.6	10.4	13.8	24.1	12.3	12.9
SGNW3	43.8N	087.7W	5.3	11.9	52.8	30.7	0.7			17.1	5.1	1.5	7.3	28.1	16.0	13.9	11.0
SISW1	48.3N	122.9W	1.9	10.9	46.8	40.9	1.4			0.8	0.9		0.8	4.2	29.9	58.3	5.1
SJLF1	30.4N	081.4W	3.7	16.9	58.2	24.6	0.3			1.1	2.5	12.9	29.0	19.7	21.1	9.9	3.7
SRST2	29.7N	094.1W	1.2	9.1	59.4	31.4	0.1			10.3	11.3	2.6	11.5	40.5	16.7	4.2	2.8
STDM4	47.2N	087.2W	1.4	5.2	32.5	53.8	6.5			18.7	3.6	2.7	2.1	18.8	18.9	20.4	14.9
WPOW1	47.7N	122.4W	9.6	30.0	56.3	13.8				31.0	47.4	3.8	1.3	13.7	1.7	0.4	0.7

JULY 1984			% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	0.2	0.2	0.9	0.7	0.6	0.5	0.3	0.6	2.0	0.8	0.6	0.9	3.9	4.6	3.1	2.3	1.9	1.0		0.7	19.8	34.9	8.4	6.3
41002	32.3N	075.3W	0.2	0.8	0.7	0.8	1.2	0.6	0.1	0.2	1.0	3.5	0.7	0.7	13.7	16.5	2.3	0.2	0.3	2.0	0.7	11.4	19.3	16.7	0.2	<.05
41006	29.3N	077.3W	0.7	0.2	0.9	0.6	0.9	0.6	0.8	0.9	0.7	2.1	11.1	21.5	18.1	6.8	4.5	1.4			1.3	11.4	12.2	3.5	0.2	0.1
42001	25.9N	089.7W		0.5	0.4	1.4	2.2				0.4	7.9	16.7	34.9	10.7	3.6	1.2	0.2		0.6	13.3	15.5	6.8				0.8
42002	26.0N	093.5W	0.3	0.5	1.9	2.3	1.0	3.5	1.9	1.0		3.2	19.3	29.4	8.2	5.1	1.9	0.5	0.3	1.3	5.5	13.0	4.1	0.1		0.4
42003	26.0N	085.9W	1.4	1.7	3.0	1.9	1.7	0.9	1.4	0.9	3.3	9.4	12.0	6.1	1.7	7.0	1.5	1.3	1.3	1.0	3.2	12.9	7.4	1.7	0.4	0.8
42007	30.1N	088.9W	1.4	0.9	0.9	1.5	3.4	2.9	1.3	0.7	6.4	3.3	5.8	13.5	18.6	10.8	6.3	5.2	0.3	0.6	3.6	2.1	2.5	2.6	1.9	1.3
42008	28.7N	095.3W	0.1	0.2	0.7	1.2	1.4	0.8	0.6	0.2	3.0	2.3	6.2	16.7	18.0	4.7	0.6	0.3	0.6	1.2	2.8	10.5	20.7	5.7	0.1	0.1
42009	29.3N	087.5W	1.1	1.0	2.8	3.1	2.2	2.0	2.0	0.7	3.0	3.8	9.2	16.6	15.5	10.2	5.1	3.3	0.1	1.2	0.7	4.9	3.6	3.3	1.6	1.2
42011	29.6N	093.5W	0.8	0.1	0.7	1.1	0.9	1.0	0.5	0.1	4.1	4.1	6.8	16.9	16.1	7.6	3.6	1.2	0.4	1.2	0.9	3.2	2.2	9.8	3.8	0.8
44005	42.7N	068.3W	0.1	0.2	0.3	0.8	1.8	2.4	2.1	1.2	0.8	0.2	0.5	2.6	9.2	26.2	7.6	2.5	0.4		0.7	0.2	11.5	12.3	2.2	2.5
44007	43.5N	070.1W	1.7	0.8	0.8	0.3	1.0	1.9	1.1	0.8	1.6	1.5	0.4	2.3	11.1	25.0	7.7	3.4	1.4	1.8	0.3	0.3	11.5	17.4	1.3	1.2
44008	40.5N	069.4W	1.1	1.2	0.8	1.0	1.0	1.8	1.3	1.0	2.4	4.0	2.6	4.4	9.7	24.0	6.4	1.3	1.5	0.8	0.9	0.8	14.1	15.2	1.5	1.1
44009	38.5N	074.6W	0.8		0.3	0.6	1.1	1.0	0.8	0.6	4.1	2.3	2.7	11.5	16.3	9.1	5.1	2.1	2.6	3.2		2.1	15.2	21.3	2.2	2.9
44011	41.1N	066.6W	0.2	0.3	0.3	1.6	1.7	1.1	0.8	0.8	3.2	2.8	4.9	19.4	18.7	5.1	2.2	0.8	0.2	0.3	0.3	11.5	21.3	2.9	0.6	1.1
44012	38.5N	074.6W	0.3	0.5		0.8	0.3	0.8	0.6	0.8	4.0	6.3	5.9	2.3	8.5	17.8	4.8	4.2	0.8	2.5	1.2	0.7	9.9	19.5	2.0	0.9
45001	48.0N	087.6W	0.2	1.0	0.5	0.8	2.2	1.6	1.6	1.3	3.4	1.2	2.6	4.8	13.4	28.6	17.3	10.3	0.3		0.1	0.4	1.2	4.2	2.3	0.9
45002	45.3N	086.3W	1.6	1.2	1.6	0.8	0.8	1.7	1.3	1.9	8.0	2.1	1.2	2.4	20.0	13.9	7.1	3.9	2.0	0.1		11.0	10.6	1.7	0.3
45003	45.3N	082.8W	0.7	0.6	1.3	1.5	1.9	2.2	2.6	3.4	2.7	1.0	0.7	1.6	13.8	16.1	11.5		0.4	0.1	0.3	3.9	11.0	1.9	0.3	2.2
45004	47.2N	086.5W	1.1	0.6	1.0	0.9	1.4	3.8	2.9	2.1	1.9	1.4	2.6	6.7	15.7	22.4	17.0	12.0			0.1		0.7	0.6	2.9	2.0
45005	41.7N	082.5W	1.8	3.8	3.8	4.9	6.1	7.4	3.9	2.6	9.1	6.0	4.3	2.7	5.1	20.9	14.0	6.6		0.6				0.1		0.3
45006	47.3N	090.0W	0.7	1.1	1.2	0.8	0.5	1.4	0.9	1.2	3.7	3.8	3.2	4.5	12.2	27.1	19.9	7.7	0.5	0.1		0.4	0.5	3.9	4.1	0.5
45007	42.7N	087.1W	1.8	1.3	0.6	2.1	2.1	1.5	2.6	0.8	10.6	6.1	2.8	5.2	25.1	14.1	5.4	4.7	2.0	0.5	1.0	0.9	4.2	1.2	1.3	4.2
45008	44.3N	082.4W	1.8	1.4	1.0	3.3	2.8	2.5	2.0	1.2	8.1	3.9	1.9	3.1	21.3	17.1	7.9	3.1	0.5	0.3		0.4	3.9	2.1	0.9	2.2
46001	56.3N	148.3W	0.9	1.4	2.7	1.5	1.1	0.3	1.2	0.9	4.9	1.6	4.7	10.1	11.1	8.2	12.2	8.0	1.3	3.4	4.7	3.0	2.4	2.0	0.6	3.1
46002	42.5N	130.3W	0.7	0.3	0.6	0.3	0.2	0.2	1.2	0.9	6.8	1.6		0.5	1.3	0.8	4.3	17.8	48.3	1.2				0.3	10.7	1
46003	51.9N	155.7W	0.2	0.1			0.4	0.3			1.3	0.2		1.0	2.4	2.3	12.1	6.9	2.3		0.2	4.3	1.8	8.2	37.2	8.8
46004	51.0N	136.0W			0.1	0.2	1.1	0.5	1.0	0.3	0.6		0.3	3.8	8.2	15.6	9.6	8.4	0.2		4.1	8.7	19.4	12.8	4.6	
46005	46.1N	131.0W	0.7	0.6		0.6	0.3	0.3	1.0	0.9	7.1	0.5		3.1	6.6	12.0	11.7	27.7	1.8		<.05	4.9	1.1	6.1	9.6	
46006	40.7N	137.7W	0.1	0.7	0.6	0.8	0.4	1.0	0.6	0.7	5.8	7.1	1.3	0.6	0.7	4.0	12.7	15.6	10.8	18.0	3.6	1.6	1.3	3.9	5.6	2.6
46011	34.9N	120.9W	1.6	0.2			0.3	1.1	3.6	4.7	10.3	0.2		<.05	1.6	2.3	7.1	36.1	1.1						0.1	27.9
46012	37.4N	122.7W	1.2		0.1	0.5	2.8	3.5	2.5	1.1	3.9	0.2	0.1	2.6	14.8	5.7	5.3	20.8	4.8		0.4	3.4	0.1	0.2	12.2
46013	38.2N	123.3W	0.4	0.5	1.2	3.3	4.6	2.4	5.0	2.6	0.9	0.3	0.9	7.4	5.0	1.5	8.5	10.4			<.05	0.1			3.2	26.4
46014	39.2N	124.0W	1.4	0.3	1.7	1.9	3.2	1.3	1.7	1.8	6.4	0.3		1.3	5.1	1.9	1.7	12.6	14.2			0.3				28.6
46016	53.3N	170.9W	0.8		0.5			1.2	0.9	1.1	2.0	2.8	5.0	0.7	1.1	5.3	10.8	11.2	2.9	0.1	9.1		0.9	12.0	16.3	4.6
46017	60.3N	172.3W	1.6			0.9		3.0	1.0	0.4	4.6	1.0			0.3	17.6	11.5	0.2	12.2	0.3		3.0	26.8	13.9	0.4	
46022	40.8N	124.5W	0.7	0.4	0.3	0.4	0.8	0.3	1.0	0.5	21.9	1.3		0.2	2.0	2.1	1.0	9.6	46.4			0.5	1.1		7.0	
46023	34.3N	120.7W	0.4	0.1		0.3	0.6	0.9	2.1	0.6	0.6	0.3		0.7	0.7	1.2	7.0	7.4	4.7					<.05	2.8	52.8
46024	32.8N	119.5W	0.2	<.05				0.2	2.1	1.7	0.1					0.4	29.2	26.0						13.9	26.1	
46025	33.6N	119.0W	0.7	0.3	0.7	1.3	4.0	5.7	7.5	3.1	0.6		0.2	1.7	3.8	8.9	45.6	5.9						9.2	0.5	
46026	37.8N	122.7W	0.4	0.1	0.8	1.5	2.4	4.2	3.7	1.3			0.1	1.0	13.7	17.5	12.4	4.1				0.8	<.05	15.2	11.1	
46027	41.8N	124.4W	0.6	0.2	0.5	0.6	0.9	1.2	2.7	2.9	0.6	0.9	2.4	4.5	1.6	1.0	5.9	11.0			0.4	1.1			3.6	17.6
46028	35.8N	121.7W	0.3		0.2	1.7	4.4	4.1	5.7	2.9	0.2			2.5	5.4	1.0	8.8	17.5						0.6	39.9
46029	46.2N	124.2W	1.5	0.5	0.5	1.0	1.2	0.9	1.2	1.2	28.7	1.0	0.1	0.8	1.7	0.9	2.2	9.6	38.8			0.2	3.4			4.5
51001	23.4N	162.2W	0.3			0.9	0.8	0.5				0.1		3.1	34.5	5.5	2.4	1.1			4.4	93.1	3.3			
BURL1	28.9N	089.4W	0.2	2.3	3.2	6.3	2.8	1.3	1.8	1.4	3.8	7.7	21.0	16.7	5.3	5.8	4.5	4.3	2.3	0.9	2.2	2.6	2.8	2.5	2.7	1.2
CSBF1	29.7N	085.4W	1.3	7.2	2.8	4.9	3.6	2.3	3.6	2.0	0.6	2.8	8.2	9.3	22.8	13.3	5.8	0.6		0.1	0.1	0.2	3.9	2.6	0.4	<.05
DBLM6	42.6N	079.5W	0.9	1.0	1.0	3.0	6.6	2.4	1.6	1.1	4.2	3.1	1.3	8.0	16.4	16.1	7.5	2.0	0.3	0.7		0.1	0.1	14.0	6.3	1.7
DISW3	47.1N	090.7W	1.5	2.8	0.9	1.1	2.2	1.2	0.9	2.3	5.1	4.7	5.7	19.2	18.2	3.4	2.6	1.4	1.2	0.6	0.3	2.1	23.1	2.7	2.2	
FBIS1	32.7N	079.9W	0.9	0.7	0.4	0.6	1.3	1.3	4.2	2.3	2.2	1.6	2.6	4.9	8.5	19.3	9.8	1.1	0.6	1.8	0.2	1.4	29.7	1.6	0.8	0.3
FFIA2	57.3N	133.6W	11.9	12.8	2.2	4.4	3.2	6.5	10.3	8.3	10.7	3.8	0.6	2.1	4.8	4.4	3.6	1.9	4.3	0.3		1.1	1.1	0.1		
GLLN6	43.5N	076.5W	0.8	0.4	0.6	0.7	1.6	4.4	1.6	0.6	2.3	3.7	0.8	2.0	19.3	15.7	6.9	2.1	0.4	<.05	0.1	1.0	7.8	12.3	11.7	2.6
LNWF1	26.7N	080.0W	1.1	0.8	0.7	0.1		1.5	1.1	0.8	0.3	1.3	10.8	19.7	5.4	0.8	1.1	0.8		0.2	12.1	35.1	5.8			
NWP03	44.6N	129.1W	5.2	4.1	1.7	1.7	0.1	1.8	0.8	1.2	22.9	1.0	2.5	<.05	1.4	1.5	0.2	1.7	38.3	1		<.05	2.6	1.0		1.2
PILM4	48.2N	088.4W	0.6	0.2	0.9	1.2	1.2	0.3	1.2	1.1	4.9	2.6	3.9	4.0	8.5	12.7	4.2	4.4	0.8	1.7	0.5	1.2	10.5	17.7	12.9	0.6
PTAT2	27.8N	097.1W	0.1	<.05	0.8	2.6	1.7	0.3	0.4	0.2	1.4	2.4	11.1	19.1	10.2	1.3	0.4	0.5	1.6	3.9	7.5	25.8	8.4	0.2		<.05
PTGC1	34.6N	120.7W	2.5			0.4	0.6	0.7	0.8	1.4	15.2	0.1	0.1	0.2	2.6	0.4	0.4	4.4	55.6				1.3	<.05		2.3
ROAM4	47.9N	089.3W	1.3	1.1	0.5	0.4	0.4	0.4	1.1	1.1	5.0	3.4	0.9	0.8	5.2	10.0	6.6	3.2	3.5	3.7		1.7	3.5	13.9	16.3	3.8
SBIO1	41.7N	082.8W	1.6	3.7	4.8	3.0	2.2	3.1	1.7	2.1	4.1	5.4	6.7	6.5	6.6	12.1	5.4	7.2	0.1	0.1	0.9	4.9	8.4	3.1	2.8	7.0
SGNW3	43.8N	087.7W	1.2	1.9	0.3	3.0	2.0	1.7	1.1	0.6	12.7	2.8	1.0	2.9	11.1	11.2	7.2	3.7	3.2	0.3	0.1	1.3	14.5	3.1	5.6	6.8
SISW1	48.3N	122.9W	0.5	0.9		0.6	0.8	2.7	3.8	1.7	0.2	<.05		0.2	2.6	14.2	26.5	3.0				0.8	12.9	26.8	0.3	
SJLF1	30.4N	081.4W	0.5	1.5	1.7	1.3	2.2	6.1	3.0	1.5	0.5	1.4	7.6	16.1	9.9	14.0	6.9	1.9	0.1	0.9	3.6	11.6	7.5	1.0	0.1	0.3
SRST2	29.7N	094.1W	3.4	1.8	0.4	0.5	0.4	0.3		1.5	6.8	1.3	1.5	7.7	22.4	8.2	3.8	1.2	0.1	2.2	0.7	3.3	16.5	8.0	0.4	0.1
STDM4	47.2N	087.2W	1.0	0.7	0.6	0.1	0.7	1.3	0.5	0.3	5.3	2.6	0.2	0.7	5.2	8.1	5.3	12.4	0.3	1.9	1.0	6.6	8.3	14.2	9.3	
WPOW1	47.7N	122.4W	7.3	13.5	2.9	0.7	1.3	6.1	1.1	0.4	0.6	19.2	20.2	6.1	0.9	0.6	7.2	1.2		0.1	4.6	5.8			3.0	0.4

JULY 1984			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W					1.5	6.3	0.8	0.1						0.1										
41002	32.3N	075.3W							0.1	<.05																
41006	29.3N	077.3W						0.1																		
42001	25.9N	089.7W			0.4	1.6																				
42002	26.0N	093.5W					0.4																			
42003	26.0N	085.9W			0.1	0.1	0.4																			
42007	30.1N	088.9W	0.1	0.1				0.1																		
42008	28.7N	095.3W	0.1			0.1	0.6	0.3																		
42009	29.3N	087.5W		0.1		0.1																				
42011	29.6N	093.5W				0.1			0.1																	
44005	42.7N	068.3W			0.5	<.05	0.1																			
44007	43.5N	070.1W																								
44008	40.5N	069.4W						0.1																		
44009	38.5N	074.6W					1.5	0.5																		
44011	41.1N	066.6W				0.2	0.1																			
44012	38.8N	074.6W					0.6	1.7																		
45001	48.0N	087.6W																								
45002	45.3N	086.3W																								
45003	45.3N	082.8W																								
45004	47.2N	086.5W																								
45005	41.7N	082.5W																								
45006	47.3N	090.0W																								
45007	42.7N	087.1W																								
45008	44.3N	082.4W					<.05	0.1																		
46001	56.3N	148.3W	0.5																							
46002	42.5N	130.3W	0.1																							
46003	51.9N	155.7W	1.0						0.2																	
46004	51.0N	136.0W					0.1																			
46005	46.1N	131.0W	3.0						0.1																	
46006	40.7N	137.7W																								
46011	34.9N	120.9W							1.9																	
46012	37.4N	122.7W							0.1																	
46013	38.2N	123.3W						3.8	11.6																	
46014	39.2N	124.0W	0.3						13.9																	
46016	53.3N	170.9W		0.7	0.4			0.1	2.0																	
46017	60.3N	172.3W						0.4	1.2																	
46022	40.8N	124.5W	2.4							0.2																
46023	34.3N	120.7W	2.2							14.9																
46024	32.8N	119.5W																								
46025	33.6N	119.0W																								
46026	37.8N	122.7W																								
46027	41.8N	124.4W						4.7	29.2								1.9	3.5								
46028	35.8N	121.7W							4.7																	
46029	46.2N	124.2W					0.3																			
51001	23.4N	162.3W																								
BURL1	28.9N	089.4W	0.2																							
CSBF1	29.7N	085.4W																								
DBLM6	42.6N	079.5W						0.5	0.1																	
DISW3	47.1N	090.7W																								
FBIS1	32.7N	079.9W						0.6	0.1																	
FFIA2	57.3N	133.6W																								
GLLN6	43.5N	076.5W						0.4	0.1																	
LNWF1	26.7N	080.0W																								
NWP03	44.6N	129.1W	4.5				0.1																			
PILM4	48.2N	088.4W			0.1			1.7	0.4	0.1																
PTAT2	27.8N	097.1W					0.1																			
PTGC1	34.6N	120.7W	10.9	1																						
ROAM4	47.9N	089.3W	0.5	0.4		0.1	0.3	2.7	6.3	1.0							0.1									
SBIO1	41.7N	082.8W							0.1	0.6																
SGNW3	43.8N	087.7W		0.1			0.5	<.05																		
SISW1	48.3N	122.9W						0.1	1.2																	
SJLF1	30.4N	081.4W		0.1			0.1																			
SRST2	29.7N	094.1W					0.1																			
STDM4	47.2N	087.2W				0.3	0.4	1.2	0.5																	
WPOW1	47.7N	122.4W																								

AUGUST 1984

BUOY	LAT	LONG	AIR TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	743	31	28.9	10 21	20.9	31 15	26.1
41002	32.3N	075.3W	744	31	28.8	08 21	21.7	31 17	27.0
41006	29.3N	077.3W	744	31	29.8	14 17	23.5	25 15	27.9
42001	25.9N	089.7W	594	31	29.4	11 20	22.5	01 14	26.4
42002	26.0N	093.5W	248	31	30.0	29 21	25.6	13 21	28.1
42003	26.0N	085.9W	743	31	28.9	12 22	24.9	21 19	27.3
42007	30.1N	088.9W	738	31	30.8	10 23	21.2	01 12	27.1
42009	29.3N	087.5W	594	31	30.6	06 22	21.9	02 20	27.2
42011	29.6N	093.5W	543	23	30.7	22 16	23.7	12 19	27.8
44004	38.5N	070.7W	739	31	27.8	04 18	17.0	25 20	22.2
44005	42.7N	068.3W	743	31	22.4	14 21	15.4	20 15	19.5
44007	43.5N	070.1W	730	31	25.1	06 04	15.1	21 10	18.5
44008	40.5N	069.4W	744	31	25.1	14 16	15.7	04 12	21.0
44009	38.5N	074.6W	721	31	28.4	04 21	19.5	19 11	23.8
44010	36.9N	075.7W	742	31	29.5	07 21	21.5	19 01	25.0
44011	41.1N	066.6W	744	31	25.1	11 18	16.0	25 18	20.1
44012	38.8N	074.6W	744	31	28.6	04 19	19.6	24 18	23.6
44013	42.4N	070.8W	552	23	28.1	16 20	15.1	21 12	19.9
45001	48.0N	087.6W	743	31	18.1	29 09	06.5	01 11	13.3
45002	45.5N	086.3W	741	31	23.6	28 23	14.2	23 12	19.7
45003	45.3N	082.8W	742	31	22.2	06 04	12.9	23 16	18.9
45004	47.2N	086.5W	741	31	17.4	15 00	06.8	01 10	13.0
45005	41.7N	082.5W	744	31	28.3	09 21	17.2	24 09	22.9
45006	47.3N	090.0W	629	31	21.8	29 11	11.5	03 11	16.5
45007	42.7N	087.1W	744	31	25.9	09 21	17.3	24 11	22.5
45008	44.3N	082.4W	744	31	25.4	16 00	14.8	23 17	20.1
46001	56.3N	148.3W	727	31	15.6	15 02	09.3	26 19	13.3
46002	42.5N	130.3W	744	31	18.5	21 02	15.1	05 03	16.8
46003	51.9N	155.7W	743	31	15.3	24 23	10.8	06 15	12.9
46004	51.0N	136.0W	743	31	15.2	25 22	11.4	31 17	13.8
46005	46.1N	131.0W	742	31	18.8	14 23	13.0	16 15	15.3
46006	40.7N	137.7W	744	31	20.3	08 00	14.2	21 20	17.4
46011	34.9N	120.9W	742	31	20.2	30 23	12.8	05 16	16.0
46012	37.4N	122.7W	677	30	17.0	29 02	13.1	08 16	14.8
46013	38.2N	123.3W	406	18	16.5	28 21	11.5	21 06	13.5
46014	39.2N	124.0W	739	31	16.0	31 23	10.7	10 16	13.4
46017	60.3N	172.3W	242	31	10.6	12 00	05.2	23 15	07.9
46022	40.8N	124.5W	740	31	18.7	17 01	11.6	03 18	14.2
46023	34.3N	120.7W	737	31	20.7	18 20	13.6	06 15	16.6
46024	32.8N	119.5W	743	31	22.7	31 01	15.0	05 11	18.2
46025	33.6N	119.0W	742	31	23.5	31 02	16.7	08 11	20.2
46026	37.8N	122.7W	738	31	16.2	29 01	11.0	09 16	13.6
46027	41.8N	124.4W	740	31	16.2	23 00	10.3	20 18	12.8
46028	35.8N	121.7W	741	31	18.0	11 00	13.0	09 12	15.2
46029	46.2N	124.2W	740	31	18.6	22 21	12.3	02 10	15.2
51001	23.4N	162.3W	486	31	27.5	21 03	23.8	18 16	26.2
BURL1	28.9N	089.4W	742	31	31.6	30 18	21.9	02 14	27.4
CARO3	43.1N	124.4W	263	12	18.7	22 21	10.1	29 13	14.0
CHLV2	36.9N	075.7W	242	11	25.9	31 23	21.8	24 15	23.6
CSBF1	29.7N	085.4W	739	31	29.6	03 18	21.8	21 00	27.0
DBLN6	42.6N	079.5W	744	31	27.3	10 14	12.2	21 10	21.6
DESW1	47.7N	124.5W	432	19	17.9	22 22	09.3	28 13	14.0
DISW3	47.1N	090.7W	743	31	30.0	27 21	12.1	24 04	18.5
FBIS1	32.7N	079.9W	743	31	33.6	07 19	20.5	27 10	26.7
FFIA2	57.3N	133.6W	739	31	19.7	05 23	07.6	28 16	12.2
GLLN6	43.5N	076.3W	743	31	27.8	10 22	13.0	20 10	21.1
LKWF1	26.7N	080.0W	553	25	31.4	20 18	22.7	22 09	27.3
MDRM1	44.0N	068.1W	171	08	17.5	28 20	12.7	25 10	15.5
NWPO3	44.6N	124.1W	733	31	17.6	16 18	09.7	20 14	13.2
PILM4	48.2N	088.4W	743	31	21.1	15 23	11.1	01 10	16.5
PTAT2	27.8N	097.1W	734	31	29.0	25 22	24.2	04 16	27.9
PTGC1	34.6N	120.7W	736	31	21.8	30 23	11.3	07 14	15.5
ROAM4	47.9N	089.3W	740	31	21.2	29 11	11.7	23 10	16.4
SBIO1	41.7N	082.8W	742	31	30.1	07 20	15.4	24 08	22.7
SGNW3	43.8N	087.7W	743	31	28.5	15 19	12.9	25 10	20.6
SISW1	48.3N	122.9W	739	31	20.3	16 20	09.9	30 11	13.4
SJLF1	30.4N	081.4W	744	31	35.5	12 18	19.9	23 07	26.6
SRST2	29.7N	094.1W	739	31	32.6	18 18	21.2	15 09	27.4
STDM4	47.2N	087.2W	744	31	22.9	15 22	09.8	01 14	15.7
TTIW1	48.3N	124.7W	379	18	18.2	17 19	09.5	21 13	13.3
WPOW1	47.7N	122.4W	738	31	23.8	16 00	11.0	29 13	15.4

BUOY	SEA TEMPERATURE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	AIR-SEA TEMPERATURE DIFFERENCE (DEG C) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	744	31	29.0	10 19	26.1	16 06	26.9	744	31	00.7	04 16	-05.4	31 12	-00.7
41002	744	31	29.2	29 22	27.0	27 23	27.8	744	31	00.5	13 19	-05.6	31 17	-00.9
41006	744	31	31.4	14 21	28.2	02 11	29.0	744	31	00.3	12 13	-05.1	25 15	-01.2
42001	582	31	31.0	29 21	28.1	01 05	29.3	596	31	-01.0	11 20	-05.8	01 14	-02.9
42002	246	31	30.6	23 21	28.7	25 03	29.5	248	31	00.9	29 21	-03.8	13 21	-01.3
42003	743	31	30.6	11 20	27.6	04 02	28.9	743	31	-00.1	02 06	-05.3	21 19	-01.6
42007	738	31	30.1	08 20	25.4	02 23	28.0	738	31	01.7	18 23	-05.9	01 11	-00.9
42009	590	31	30.5	07 21	26.8	03 05	28.6	608	31	00.9	15 15	-06.1	13 20	-01.4
42011														
44004	739	31	28.6	15 21	20.7	01 07	25.5	739	31	05.3	04 18	-09.3	25 20	-03.3
44005	743	31	21.7	16 20	16.7	01 07	19.4	743	31	02.7	01 07	-03.7	20 15	00.1
44007	730	31	21.4	06 17	14.7	31 10	17.6	733	31	06.9	02 00	-02.7	11 00	00.9
44008	744	31	26.3	16 19	13.0	04 05	20.7	744	31	08.5	08 08	-05.7	18 00	00.3
44009	713	31	26.6	17 21	19.5	02 09	24.1	736	31	03.6	04 21	-05.7	19 11	-00.3
44010	742	31	28.5	14 18	21.2	01 09	25.3	742	31	03.2	02 19	-05.2	19 01	-00.2
44011	744	31	24.5	17 18	15.9	11 10	19.9	744	31	05.9	12 02	-06.7	21 00	00.2
44012	743	31	26.8	17 21	19.5	01 11	23.6	744	31	04.7	02 20	-04.0	20 13	00.0
44013	552	23	22.9	15 20	15.9	30 15	19.3	552	23	07.0	30 15	-04.2	21 12	00.6
45001	743	31	15.6	28 22	05.7	01 02	11.9	743	31	06.0	01 20	-00.8	23 10	01.4
45002	741	31	24.4	13 21	17.6	01 09	20.0	741	31	04.7	28 23	-04.5	23 11	-00.3
45003	742	31	20.0	15 23	16.0	01 14	18.5	742	31	04.4	06 04	-05.3	23 16	00.4
45004	742	31	14.1	15 03	05.0	01 00	10.7	742	31	06.6	01 01	-00.7	17 01	02.2
45005	744	31	26.3	18 22	22.4	24 09	24.0	744	31	03.0	09 21	-03.2	24 09	-01.1
45006	630	31	19.3	29 11	12.3	02 15	15.9	630	31	04.6	14 22	-02.5	23 16	00.7
45007	744	31	24.9	14 23	20.8	01 12	22.6	744	31	02.8	30 02	-04.1	24 11	-00.2
45008	744	31	22.3	04 22	18.5	01 11	20.2	744	31	04.3	16 00	-04.9	23 17	-00.1
46001	718	31	15.4	07 04	11.5	31 12	13.8	738	31	01.4	25 04	-03.6	15 14	-00.5
46002	744	31	18.3	18 00	17.0	01 15	17.7	744	31	00.6	07 03	-02.6	30 05	-00.9
46003	421	18	14.6	15 04	12.3	01 18	13.4	743	31	01.6	24 23	-02.9	31 14	-00.6
46004	743	31	15.2	16 23	13.3	01 12	14.1	743	31	00.9	25 22	-02.2	31 17	-00.3
46005	742	31	18.6	19 22	15.2	07 08	16.1	742	31	01.6	14 23	-03.1	16 15	-00.8
46006	743	31	20.6	18 21	19.1	02 16	19.6	744	31	00.9	07 22	-05.8	21 20	-02.2
46011	742	31	18.8	15 22	13.7	06 11	16.6	743	31	04.6	30 23	-03.2	24 12	-00.6
46012	679	30	16.3	29 00	13.6	05 04	14.5	708	31	01.9	25 01	-02.1	01 03	00.2
46013	406	18	15.1	29 02	10.0	05 18	12.5	564	25	03.0	05 02	-01.5	27 14	01.1
46014	738	31	15.5	29 22	10.5	02 13	12.7	740	31	03.2	03 01	-02.7	16 14	00.7
46017														
46022	738	31	17.8	17 01	11.7	06 07	14.4	741	31	02.0	11 17	-04.1	20 16	-00.2
46023	737	31	20.3	15 22	14.9	05 02	17.8	736	31	01.7	11 00	-03.7	23 03	-01.2
46024	742	31	21.7	26 20	17.8	04 10	19.6	743	31	02.3	11 20	-03.0	05 11	-01.4
46025	742	31	24.3	15 22	21.2	27 08	22.5	743	31	01.2	31 02	-06.2	08 11	-02.3
46026	738	31	17.0	07 22	11.5	04 07	14.4	741	31	01.1	17 07	-03.9	09 07	-00.8
46027	741	31	15.1	28 05	09.7	21 13	12.2	743	31	04.9	23 00	-02.2	12 17	00.6
46028	741	31	18.1	28 21	14.1	15 09	16.1	741	31	01.8	11 00	-02.8	21 12	-00.9
46029	736	31	19.0	22 22	11.4	09 18	15.0	743	31	03.6	09 21	-02.4	26 12	00.2
51001	492	31	28.8	21 03	26.5	01 16	27.1	492	31	00.0	03 19	-03.1	18 16	-01.0
BURL1														
CARO3														
CHLV2	242	11	26.8	23 21	24.1	26 10	24.7	242	11	01.1	31 02	-03.0	23 21	-01.1
CSBF1														
DBLN6														
DESW1														
DISW3														
FBIS1														
FFIA2														
GLLN6														
LKWF1	218	10	29.6	30 21	27.8	22 13	28.7	219	10	00.2	26 00	-04.8	31 21	-01.4
MDRM1														
NWPO3														
PILM4														
PTAT2														
PTGC1														
ROAM4														
SBIO1														
SGNW3														
SISW1														
SJLF1														
SRST2														
STDM4														
TTIW1														
WPOW1														

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BUOY	LAT	LONG	PRESSURE (MB) OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	744	31	1025.4	02 04	1009.3	20 09	1016.6
41002	32.3N	075.3W	744	31	1025.2	02 04	1009.3	20 07	1016.7
41006	29.3N	077.3W	744	31	1024.8	02 17	1010.4	19 08	1017.7
42001	25.9N	089.7W	594	31	1021.0	05 17	1010.5	01 01	1016.9
42002	26.0N	093.5W	248	31	1020.4	16 15	1011.4	01 00	1016.3
42003	26.0N	085.9W	743	31	1020.8	05 15	1010.9	19 21	1016.7
42007	30.1N	088.9W	738	31	1021.5	06 15	1009.3	19 08	1016.8
42009	29.3N	087.5W	594	31	1021.4	02 21	1008.4	19 08	1016.2
42011	29.6N	093.5W	543	23	1021.0	16 15	1009.1	20 01	1015.9
44004	38.5N	070.7W	737	31	1022.6	26 15	1006.7	08 08	1014.9
44005	42.7N	068.3W	743	31	1023.6	26 15	1005.2	07 22	1014.8
44007	43.5N	070.1W	731	31	1023.7	26 15	1003.6	07 21	1014.6
44008	40.5N	069.4W	744	31	1023.5	26 16	1004.8	08 08	1014.7
44009	38.5N	074.6W	714	31	1024.9	26 15	1007.8	07 23	1015.8
44010	36.9N	075.7W	742	31	1025.1	26 16	1008.1	19 21	1016.2
44011	41.1N	066.6W	744	31	1023.3	26 17	1006.7	08 07	1015.6
44012	38.8N	074.6W	741	31	1024.9	26 14	1006.7	08 07	1015.3
44013	42.4N	070.8W	550	23	1023.4	26 15	1005.6	31 10	1014.4
45001	48.0N	087.6W	743	31	1025.2	11 14	1002.3	29 11	1014.5
45002	45.3N	086.3W	741	31	1023.8	24 15	1003.4	09 00	1014.5
45003	45.3N	082.8W	742	31	1024.5	25 13	1003.7	30 12	1014.7
45004	47.2N	086.5W	742	31	1024.5	11 16	1003.2	09 13	1014.8
45005	41.7N	082.5W	744	31	1025.5	25 16	1005.9	30 14	1015.6
45006	47.3N	090.0W	630	31	1025.6	23 16	1001.9	09 09	1015.3
45007	42.7N	087.1W	744	31	1024.9	25 16	1002.8	30 06	1015.3
45008	44.3N	082.4W	744	31	1025.0	25 16	1003.0	30 11	1014.9
46001	56.3N	148.3W	727	31	1025.3	03 10	995.4	25 17	1012.5
46002	42.5N	130.3W	744	31	1024.4	19 19	1009.7	16 03	1019.3
46003	51.9N	155.7W	743	31	1031.0	26 21	999.3	18 12	1019.2
46004	51.0N	136.0W	743	31	1021.4	25 07	1005.0	07 05	1015.2
46005	46.1N	131.0W	742	31	1025.4	19 18	1010.7	16 12	1018.5
46006	40.7N	137.7W	743	31	1028.9	30 20	1012.1	15 11	1022.5
46011	34.9N	120.9W	743	31	1019.3	29 15	1009.3	09 11	1014.5
46012	37.4N	122.7W	676	30	1022.1	30 19	1011.1	05 01	1015.2
46013	38.2N	123.3W	406	18	1021.0	29 16	1008.4	06 17	1015.0
46014	39.2N	124.0W	739	31	1022.0	30 20	1009.4	09 13	1014.8
46017	60.3N	172.3W	242	31	1030.3	29 21	989.5	01 15	1012.6
46022	40.8N	124.5W	740	31	1023.9	31 18	1010.7	25 14	1017.0
46023	34.3N	120.7W	737	31	1018.9	28 19	1009.3	09 11	1014.1
46024	32.8N	119.5W	743	31	1018.0	29 16	1009.1	05 03	1013.5
46025	33.6N	119.0W	742	31	1016.5	29 16	1007.4	09 03	1012.2
46026	37.8N	122.7W	739	31	1022.5	30 19	1008.8	10 03	1015.1
46027	41.8N	124.4W	741	31	1025.0	31 18	1011.1	10 02	1017.4
46028	35.8N	121.7W	741	31	1021.0	30 19	1009.6	09 13	1015.1
46029	46.2N	124.2W	741	31	1023.2	03 18	1012.0	27 12	1017.6
51001	23.4N	162.3W	492	31	1020.3	16 20	1011.9	30 02	1015.8
BURL1	28.9N	089.4W	739	31	1022.1	06 16	1010.1	19 08	1017.5
CARO3	43.1N	124.4W	263	12	1024.2	31 18	1012.3	26 02	1017.8
CHLV2	36.9N	075.7W							
CSBF1	29.7N	085.4W	738	31	1022.4	26 15	1009.0	19 22	1017.4
DBLN6	42.6N	079.5W	743	31	1025.7	25 14	1002.9	30 15	1015.8
DESW1	47.7N	124.5W	433	19	1023.0	19 18	1010.6	27 11	1017.5
DISW3	47.1N	090.7W	743	31	1025.0	23 12	1001.6	29 00	1014.3
FBIS1	32.7N	079.9W	742	31	1023.8	26 15	1008.1	19 21	1016.2
FFIA2	57.3N	133.6W	738	31	1019.9	03 23	996.9	26 21	1012.8
GLLN6	43.5N	076.3W	743	31	1024.3	25 16	1003.9	30 20	1014.7
LKWF1	26.7N	080.0W	651	29	1021.9	03 03	1011.4	19 23	1017.0
MDRM1	44.0N	068.1W	171	08	1022.5	26 15	1005.8	31 19	1015.6
NWPO3	44.6N	124.1W	731	31	1023.8	03 15	1012.3	10 02	1017.8
PILM4	48.2N	088.4W	742	31	1025.5	11 13	1001.6	29 10	1014.3
PTAT2	27.8N	097.1W	733	31	1020.9	16 16	1009.7	20 01	1015.3
PTGC1	34.6N	120.7W	735	31	1018.6	29 17	1007.8	09 11	1014.0
ROAM4	47.9N	089.3W	740	31	1025.6	23 14	1002.4	09 08	1014.7
SBIO1	41.7N	082.8W	280	13	1027.0	26 17	1004.4	30 13	1015.6
SGNW3	43.8N	087.7W	743	31	1024.8	25 15	1004.6	08 23	1015.5
SISW1	48.3N	122.9W	739	31	1023.4	07 18	1008.5	27 02	1016.7
SJLF1	30.4N	081.4W	675	29	1023.5	26 16	1009.0	19 21	1016.5
SRST2	29.7N	094.1W	735	31	1021.6	16 15	1009.9	20 08	1016.5
STDM4	47.2N	087.2W	744	31	1025.5	11 17	1003.2	09 12	1015.5
TTIW1	48.3N	124.7W	378	18	1022.5	29 15	1009.1	27 10	1017.3
WPOW1	47.7N	122.4W	738	31	1022.9	28 17	1008.8	27 00	1016.6

BUOY	WIND SPEEDS (KNOTS) OBS	MAX	DY HR	DIR	MEAN WIND SPEED (KNOTS) N	NE	E	SE	S	SW	W	NW	TOTAL
41001	733	25	14 07	270	9.3	10.8	9.3	8.4	8.6	12.0	11.2	11.2	10.7
41002	727	20	31 17	320	9.6	8.3	8.0	6.8	8.9	11.2	11.2	8.5	10.0
41006	715	24	20 17	350	7.0	6.9	4.6	8.3	6.5	8.5	8.3	6.6	07.6
42001	593	30	01 02	110	6.7	8.1	10.8	10.4	11.1	8.1	8.8	6.4	09.8
42002	242	22	22 18	180	6.8	7.9	8.2	9.6	7.0	6.6	5.8	8.6	08.5
42003	741	27	27 18	010	7.2	8.4	8.4	9.9	7.0	10.9	9.9	5.6	08.6
42007	717	20	02 18	150	6.0	6.1	7.5	7.5	7.8	7.5	8.3	6.4	07.3
42009	558	28	13 20	230	5.4	4.6	7.7	9.7	6.5	6.6	7.6	6.8	07.3
42011	541	26	06 13	190	7.1	10.1	9.5	9.6	11.2	9.8	11.4	9.6	10.2
44004	719	27	13 19	130	10.5	12.9	9.9	11.7	9.2	10.1	8.2	9.2	10.2
44005	728	17	20 16	070	8.3	7.0	8.1	9.0	10.0	8.5	5.1	7.4	08.2
44007	723	15	18 04	030	7.2	7.3	6.8	5.5	8.4	8.4	5.6	5.3	07.4
44008	725	17	20 19	340	9.3	7.7	8.1	6.8	8.0	7.6	6.8	6.4	07.7
44009	719	19	24 13	350	8.4	7.5	6.5	5.1	9.7	8.7	5.2	7.5	07.9
44010	671	14	24 14	010	7.6	5.9	4.6	4.0	7.4	7.1	5.1	5.5	06.2
44011	722	20	20 23	350	9.4	8.5	6.1	5.9	7.1	6.1	6.6	6.4	07.2
44012	743	21	24 09	030	8.1	8.3	9.1	5.5	9.9	8.5	5.8	7.9	08.2
44013	552	19	20 07	330	9.6	8.4	6.0	5.7	9.2	8.3	6.8	7.6	08.0
45001	716	14	17 22	170	5.3	5.0	3.7	5.2	6.7	6.9	6.9	5.8	06.0
45002	704	21	19 02	340	9.3	6.2	4.9	4.6	10.3	9.9	7.0	9.6	08.8
45003	709	25	30 06	260	7.6	8.8	7.3	7.0	8.6	7.3	7.4	7.1	07.6
45004	696	14	27 03	150	5.4	4.6	3.8	5.8	6.5	7.1	6.0	5.3	05.9
45005	713	11	20 01	010	6.0	4.7	4.0	3.8	4.1	4.4	4.2	4.5	04.5
45006	608	16	21 11	230	5.2	7.5	6.4	5.1	6.0	8.4	9.6	7.0	07.2
45007	736	24	30 12	330	10.9	7.6	6.1	7.5	9.2	6.8	7.0	11.1	08.7
45008	735	20	30 12	160	7.5	7.0	4.6	6.3	9.1	7.4	7.2	7.3	07.6
46001	716	31	26 23	290	6.1	5.0	7.0	8.3	11.1	12.0	12.0	12.4	11.1
46002	739	19	16 11	250	11.4	9.1	1.0	4.7	10.3	8.6	8.8	9.4	09.6
46003	737	28	24 21	200	4.2	7.6	11.0	10.7	15.2	14.0	12.0	9.8	11.9
46004	737	24	27 04	280	6.9	10.2	10.5	7.5	8.8	10.9	11.7	9.9	10.6
46005	732	27	06 18	160	12.6	10.8	7.3	8.8	15.2	11.7	9.8	11.1	11.4
46006	743	25	27 13	030	13.4	16.2	2.2	9.6	13.8	15.6	13.4	11.1	13.3
46011	730	26	30 19	320	8.4	3.8	3.5	2.8	3.0	2.6	5.2	11.8	10.9
46012	682	23	31 01	320	10.0	2.3		10.7	7.8	7.2	4.7	11.2	10.3
46013	387	28	04 03	290	4.3		2.0	2.8	1.7	2.3	15.0	15.0	14.3
46014	726	28	04 02	320	9.9	4.4	2.7	6.8	5.0	4.2	3.8	15.6	13.7
46017	239	49	03 03	070	12.2	15.2	16.8	14.1	16.1	11.0	8.5	11.5	12.2
46022	720	22	01 12	340	9.9	3.5	2.5	2.8	6.7	5.5	4.8	9.6	08.8
46023	717	34	31 09	330	15.3	1.8	4.0	4.9	4.6	5.4	6.1	18.4	17.2
46024	728	25	30 20	310	2.9		1.0	2.8	2.3	4.0	8.0	11.9	09.8
46025	732	18	31 06	290	2.0	3.0	2.8	4.1	4.4	4.4	7.0	7.4	05.7
46026	730	24	30 15	290	2.0		1.0	9.6	8.2	6.7	10.2	12.0	10.3
46027	741	29	20 00	310	2.5	1.3	3.9	4.8	2.2	2.1	8.8	9.0	07.0
46028	737	28	03 08	310	6.4	2.3	4.5	4.4	4.4	4.3	6.2	16.3	15.3
46029	700	21	27 12	170	9.9	3.4	3.5	4.8	7.5	4.4	4.4	6.1	07.0
51001	473	20	15 07	060	2.3	9.3	11.7	9.5	2.8	1.7	1.0	1.2	10.7
BURL1	742	26	02 06	110	4.9	6.2	9.4	6.1	6.4	7.3	6.8	5.5	06.9
CARO3	263	18	25 19	010	6.3	3.9	1.1	4.1	7.1	8.2	2.2	2.8	05.2
CHLV2	242	22	29 02	220	10.5	13.0	7.0	3.9	12.2	12.9	11.3	6.6	11.1
CSBF1	736	15	12 08	270	2.8	2.2	3.6	4.6	4.5	5.3	7.4	4.2	05.0
DBLN6	742	22	20 06	030	8.4	6.7	3.3	4.7	4.4	9.1	6.6	7.0	06.4
DESW1	432	26	16 20	160	7.4	5.4	4.6	9.6	8.3	3.5	3.8	9.4	07.3
DISW3	743	23	30 15	260	6.5	8.7	6.5	5.1	6.7	10.4	10.3	11.4	08.1
FBIS1	741	18	20 02	210	4.0	9.8	8.4	6.6	7.8	10.5	4.3	3.6	07.5
FFIA2	739	32	25 11	150	7.4	4.0	3.8	12.4	8.1	3.5	2.2	2.1	07.4
GLLN6	742	26	30 21	260	6.2	5.7	3.8	6.9	9.3	7.0	8.8	6.7	07.5
LKWF1	648	21	03 22	120	5.1	8.1	7.4	8.6	8.3	3.8	2.9	3.2	06.9
MDRM1	171	21	31 00	170	13.2	16.0		15.0	14.5	11.8	8.5	9.7	12.6
NWPO3	735	24	20 01	350	8.1	2.7	2.7	2.1	5.0	5.3	1.9	5.2	05.3
PILM4	743	24	31 13	280	6.3	8.1	5.5	7.3	10.1	10.1	11.0	6.1	08.6
PTAT2	733	22	07 08	150	8.2	6.7	10.9	13.1	11.6	6.8	5.1	5.2	12.0
PTGC1	738	29	03 03	350	14.8	4.4		3.5	8.7	4.2	3.0	6.3	14.0
ROAM4	740	32	27 00	210	10.5	9.5	6.1	8.9	8.5	12.7	12.5	6.5	10.3
SBIO1	742	25	31 02	290	4.7	4.2	4.7	6.9	8.2	7.5	7.7	6.5	06.5
SGNW3	742	34	30 05	360	9.9	8.3	3.9	7.3	10.2	7.0	8.1	9.2	08.6
SISW1	739	26	01 03	240	3.1	2.4	1.4	7.8	6.0	9.7	8.8	4.1	08.2
SJLF1	744	23	22 15	360	10.6	8.3	8.2	9.3	9.1	5.2	5.9	6.2	07.5
SRST2	737	21	04 00	180	4.2	4.9	9.5	10.0	10.7	11.2	6.4	4.1	09.2
STDM4	744	27	22 21	010	13.4	8.0	7.6	10.7	13.4	12.5	12.9	11.3	11.8
TTIW1	376	28	16 21	190	3.2	4.0	5.7	9.4	8.7	5.7	7.0	6.0	07.0
WPOW1	737	25	27 12	180	4.6	4.7	3.7	3.9	5.7	4.1	1.7	1.3	04.9

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BUOY	LAT	LONG	WAVE HEIGHTS (METERS) ORS	MAX	DY	HR	MEAN	FREQUENCY OF WAVE HEIGHTS (%) <1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
41001	34.9N	072.9W	737	3.5	24	06	1.0	27.1	67.0	5.1	0.6				
41002	32.3N	075.3W	036	1.5	31	12	1.1	2.7	97.2						
41004	29.3N	077.3W	743	2.5	20	15	0.9	23.8	73.7	2.4					
42001	25.9N	089.7W	596	3.0	01	17	0.7	70.9	22.3	6.1	0.8				
42002	26.0N	093.5W	232	1.5	01	00	0.7	66.8	33.1						
42003	26.0N	085.9W	608	1.5	01	05	0.6	80.4	19.5						
42007	30.1N	088.9W	286	1.0	01	10	0.5	91.2	8.7						
44005	42.7N	068.3W	743	2.5	15	07	0.9	32.5	64.6	2.9					
44007	43.5N	070.1W	655	1.5	14	16	0.5	84.8	15.1						
44008	40.5N	069.4W	735	3.0	14	23	0.8	45.4	48.8	5.4	0.2				
44010	36.9N	075.7W	705	1.5	24	15	0.5	83.6	16.3						
44011	41.1N	066.6W	742	3.0	14	22	1.0	28.1	61.1	10.2	0.4				
45001	48.0N	087.6W	465	2.0	30	21	0.7	65.5	33.5	0.8					
45002	45.3N	086.3W	529	2.5	27	21	0.8	57.6	36.2	6.2					
45003	45.3N	082.8W	145	2.0	30	07	0.7	48.9	49.6	1.3					
45004	47.2N	086.5W	405	2.0	23	02	0.6	74.8	24.9	0.2					
46035	41.7N	082.5W	418	2.0	20	04	0.6	76.7	22.9	0.2					
45036	47.3N	090.0W	442	1.5	09	17	0.6	66.9	33.0						
45037	42.7N	087.1W	587	2.5	19	04	0.8	53.3	39.6	6.9					
45038	44.3N	082.4W	536	2.0	23	15	0.7	53.3	45.8	0.7					
46011	56.3N	148.3W	720	8.0	26	18	1.9	11.1	50.9	23.1	5.9	2.3	6.1	0.2	
46041	51.0N	136.0W	742	7.0	27	20	1.8	4.9	49.4	33.8	4.8	5.2	1.6		
46042	51.6N	131.0W	737	5.0	28	08	1.4	3.6	77.6	12.6	4.7	1.3			
46035	46.1N	131.0W	740	3.5	28	21	1.4		77.2	19.5	3.1				
46036	40.7N	137.7W	625	3.0	03	09	1.4		76.1	23.6	0.1				
46012	37.4N	122.7W	603	3.0	01	04	1.8		45.9	46.8	7.1				
46013	38.2N	123.3W	727	4.5	31	10	1.8		54.2	40.1	1.5				
46014	39.2N	124.0W	722	3.5	01	05	1.6	2.0	80.8	9.4					
46022	40.8N	124.5W	413	2.5	19	13	1.2	9.6	47.0	47.5	4.8	0.5			
46023	34.3N	127.7W	727	4.5	31	10	1.8		47.0	47.5	5.3	1.3			
46024	32.8N	119.5W	725	4.5	31	15	1.4		72.2	23.1	3.1				
46025	33.6N	119.0W	740	2.5	31	05	0.9	22.5	73.6	3.7					
46026	37.8N	122.7W	731	2.5	01	12	1.2		90.8	9.1					
46028	35.8N	121.9W	735	3.5	02	05	2.0		31.5	55.2	13.1				
46029	46.2N	124.2W	726	3.5	28	19	1.1	20.2	71.2	6.1	2.3				
51001	23.4N	162.3W	482	2.5	04	13	1.6		52.6	47.3					
CHLV2	36.9N	075.7W	105	0.5	27	12	0.5	8.8							60.1
DISW3	47.1N	090.7W	123	0.0	00	00	0.0								

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BUOY	LAT	LONG	TOTAL FREQUENCY OF WIND SPEEDS (%) CALM	<4KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	TOTAL FREQUENCY OF WIND DIRECTIONS (%) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		6.0	46.1	45.3	2.6			11.9	13.3	4.5	2.8	10.4	25.3	23.9	7.7
41002	32.3N	075.3W		5.9	45.1	49.0				6.3	4.1	6.3	5.3	15.3	28.2	29.6	5.2
41004	29.3N	077.3W		16.6	60.1	22.9	0.3			8.7	4.0	8.7	13.5	12.2	27.4	21.0	4.6
42001	25.9N	089.7W		4.7	61.6	29.5	4.2			4.3	8.2	20.6	31.2	11.7	6.7	6.8	4.5
42002	26.0N	093.5W		10.3	61.2	28.1	0.4			3.0	7.9	22.9	46.9	11.4	4.6	1.9	1.4
42003	26.0N	085.9W		7.3	65.0	27.3	0.4			7.6	22.3	27.9	18.2	8.7	6.2	6.4	2.7
42007	30.1N	088.9W		11.6	71.4	17.0				7.5	6.3	9.6	19.3	16.5	13.9	15.3	11.5
44005	42.7N	068.3W		13.3	68.5	17.9	0.4			4.3	3.7	10.3	16.3	12.5	17.7	23.4	11.7
44007	43.5N	070.1W		12.6	56.5	20.9				5.4	4.1	4.8	8.4	8.4	28.3	30.1	12.8
44008	40.5N	069.4W		10.2	71.3	18.5				13.2	13.7	8.8	9.1	16.0	22.0	9.8	8.5
44009	38.5N	074.6W	5.1	13.2	61.3	25.5				9.9	9.8	8.5	7.9	7.9	16.5	32.8	6.7
44010	36.9N	075.7W		20.3	71.8	7.9				12.5	56.9	30.6					
44011	41.1N	066.6W		13.9	69.8	16.3				12.6	56.5	20.9					
44012	38.8N	074.6W	7.0	11.4	61.9	26.6				10.2	71.3	18.5					
44013	42.4N	070.8W	5.8	10.7	65.6	23.7				5.1	15.3	7.9	4.0	16.9	18.5	8.3	14.9
45001	48.0N	087.6W		23.3	70.7	6.0				13.2	61.3	25.5					
45002	45.3N	086.5W		15.1	67.2	17.8				16.8	12.3	10.1	7.1	19.1	11.5	10.5	12.7
45003	45.3N	082.8W		11.8	67.6	20.5	0.1			22.0	72.6	5.5					
45004	47.2N	086.5W		22.0	72.6	5.5				13.6	12.6	8.8	7.9	10.7	27.7	13.7	4.9
45005	41.7N	082.5W		33.7	65.9	0.4				9.0	17.0	12.3	9.5	11.8	19.9	13.8	6.6
45006	47.3N	090.0W		13.8	70.9	15.3				19.6	6.6	5.6	12.2	29.4	11.7	7.7	7.5
45007	42.7N	087.1W		10.9	53.5	35.3	0.3			21.8	10.4	6.3	5.2	20.6	13.4	8.9	8.9
45008	44.3N	082.4W		16.9	59.9	23.3				3.9	2.9	4.4	4.2	13.2	20.6	33.3	17.4
46011	56.3N	148.3W		6.7	45.1	39.9	8.2			23.2	2.4	0.1	0.2	3.2	16.4	23.5	30.9
46022	40.5N	124.5W		3.7	57.5	38.8				2.6	2.8	3.9	3.6	8.4	25.9	33.3	19.6
46023	34.3N	127.7W		4.5	34.3	56.9	4.3			3.4	6.1	2.8	3.5	10.1	25.4	37.2	11.4
46024	32.8N	119.5W		6.5	43.7	48.7	1.1			16.1	0.8	0.9	0.4	9.0	18.2	25.9	31.6
46025	33.6N	119.0W		3.8	39.5	55.6	1.1			31.7	9.5	0.6	0.7	3.8	12.1	16.6	24.9
46026	37.8N	122.7W		2.6	28.0	65.0	4.4			10.7	1.1	0.2	0.7	0.6	2.1	2.8	82.1
46011	34.9N	127.9W		7.5	46.2	44.4	3.8			20.0	0.3		1.1	3.0	4.3	4.7	66.6
46012	37.4N	122.7W		6.3	47.4	46.2	0.1			1.1		0.8	1.9	0.7	1.5	29.7	69.3
46013	38.2N	123.3W		13.7	16.5	50.4	19.4			15.6	0.7	0.4	2.9	3.4	1.2	1.2	74.6
46014	39.2N	124.0W		6.5	24.0	58.4	11.2			10.7	10.9	5.9	7.1	18.5	17.4	7.4	4.4
46017	60.3N	172.3W		10.9	72.6	47.7	8.4		0.4	64.3	7.2	3.2	1.8	3.5	1.5	0.9	17.5
46022	40.8N	124.5W		15.7	46.7	37.4	0.3			11.2	0.1	0.5	0.9	0.6	1.2	2.9	82.6
46023	34.3N	127.7W		2.9	14.8	53.0	29.0	0.3		1.0		0.1	0.6	1.4	6.4	34.0	56.5
46024	32.8N	119.5W		7.8	54.0	35.4	2.7			0.1	<.05	1.4	9.8	17.5	20.6	43.6	6.8
46025	33.6N	119.0W		24.6	69.3	6.1				0.2		0.2	1.4	3.6	8.5	56.8	29.2
46026	37.8N	122.7W		5.3	49.6	44.7	0.4			5.0	3.4	4.6	11.4	5.8	3.6	27.4	38.5
46027	41.8N	124.4W	19.2	29.1	44.4	22.9	3.5			2.3	0.2	0.4	1.2	0.4	0.5	4.2	90.7
46028	35.8N	121.9W		4.3	21.7	53.5	20.5			30.8	2.0	2.8	9.1	18.9	9.2	8.6	18.6
46029	46.2N	124.2W		23.1	54.7	22.1				1.5	17.4	69.8	8.6	1.4	0.8	0.2	0.5
51001	23.4N	162.3W		6.4	33.0	60.5				2.0	3.3	15.9	23.3	22.1	14.0	14.3	5.2
51WL1	28.9N	089.4W	6.6	24.4	55.5	19.0	1.1			20.3	31.3	11.6	1.2	10.5	20.5	3.2	1.3
CAR31	43.1N	124.4W	18.3	38.0	46.4	15.6				6.4	21.5	6.6	3.0	12.4	24.5	16.3	11.4
CHLV2	36.9N	075.7W	2.5	9.5	31.4	58.7	0.4			4.4	10.5	7.4	12.5	15.8	14.6	25.2	9.7
CSBF1	29.7N	085.4W	7.2	32.1	42.2	5.7				9.5	8.7	6.3	10.8	23.3	21.2	14.6	5.6
DPLM1	42.6N	079.5W	5.1	24.8	59.0	16.0	0.1			17.4	7.3	9.1	8.9	12.8	7.2	8.6	28.7
DESJ1	47.7N	124.5W	7.4	20.6	57.9	19.2	2.3			9.3	21.6	11.5	9.8	17.9	19.6	7.5	3.5
DISJ3	47.1N	090.7W	4.2	16.2	53.4	29.7	0.4			7.8	8.8	9.9	9.5	11.5	29.7	16.6	6.2
FPIS1	32.7N	079.9W	2.2	18.1	54.8	27.1				23.7	7.7	5.6	25.7	17.9	7.7	5.6	6.1
FFIA2	57.3N	133.6W	15.6	30.9	37.3	28.8	2.8			7.3	11.8	4.4	6.9	22.3	19.4	20.2	7.6
GLLN6	43.5N	076.3W	4.2	19.3	52.6	27.8	0.4			3.4	12.5	18.9	25.6	15.8	13.2	5.9	4.8
LKWF1	26.7N	080.0W	3.5	21.1	61.6	17.3				9.8	0.3		0.3	42.1	32.9	9.9	4.7
MDRM1	44.2N	065.1W		1.2	20.5	78.4				31.8	3.8	16.1	1.0	14.1	12.9	7.4	12.9
NWP03	44.6N	124.1W	15.5	42.0	43.1	14.0	0.8			8.3	6.6	11.3	14.5	24.0	16.0	10.6	6.6
PILM1	48.2N	088.4W	2.7	14.3	54.9	29.6	1.2			0.6	2.6	17.3	59.2	16.0	3.0	0.4	0.8
PTAT2	27.8N	097.1W	0.3	2.7	33.3	63.8	0.1			90.6	0.2		0.1	3.2	0.6	0.3	4.8
PTGC1	34.6N	120.7W	1.4	3.5	30.8	51.2	14.5			9.1	12.5	6.7	12.0	13.3	29.3	16.0	5.1
RPAN1	47.9N	089.3W	4.3	15.3	39.3	41.5	3.9			13.6	10.9	11.2	7.5	16.7	22.1	10.3	7.8
SPIO1	41.7N	082.9W	4.6	25.7	56.7	17.3	0.3			13.8	14.1	4.3	7.0	25.7	12.6	13.6	9.1
SPN31	43.8N	087.7W	3.2	12.9	54.6	32.1	0.3	0.1		0.9	0.3	0.3	1.0	2.4	10.1	32.6	44.4
STSW1	48.3N	122.9W	4.5	20.3	49.0	29.6	1.1			2.6	4.0	13.9	17.7	16.7	16.4	20.0	6.8
SJLF1	30.4N	081.4W	1.7	10.8	70.0	19.0	0.3			9.0	5.1	2.5	11.2	39.3	21.0	5.8	6.0
SRST2	29.7N	094.1W	2.2	8.5	50.3	41.1				14.7	10.1	8.5	11.1	24.3	11.6	12.9	7.1
STDM1	47.2N	087.2W	1.5	9.8	36.3	47.6	6.3			3.3	6.2	4.1	1.4	42.0	31.3	8.8	2.9
TTIW1	48.3N	124.7W	6.9	21.8	57.7	19.7	0.8			15.6	41.5	1.9	7.3	31.0	1.4	0.4	0.8
WPO41	47.7N	122.4W	12.5	36.6	50.7	8.5	0.1										

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BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (<4 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (4-10 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (11-21 KTS) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	1.2	1.6	0.5	0.3	0.5	0.9	0.6	0.4	6.1	4.9	2.9	1.7	7.0	10.1	10.6	7.9	4.7	6.6	1.2	0.9	3.0	12.6	12.2	4.2
41002	32.3N	075.3W	0.4	0.6	1.1	0.9	1.4	0.8	0.7	0.2	3.1	2.1	3.9	3.9	6.8	9.9	9.6	3.8	2.7	1.6	1.4	0.5	5.0	17.5	19.1	1.2
41006	29.3N	077.3W	1.0	0.5	3.1	1.4	3.1	4.1	1.7	0.9	5.6	3.0	5.6	7.8	6.8	13.5	14.3	3.5	1.2	0.5		4.2	2.2	9.8	4.9	0.2
42001	25.9N	089.7W	1.1	0.2	0.1	0.7	1.1	0.6	0.1	0.8	2.6	6.7	15.8	10.5	9.6	4.0	5.1	3.3	0.6	1.3	9.2	10.8	3.5	2.1	1.6	0.6
42002	26.0N	093.5W	0.7	0.9	2.6	2.6	2.5	1.0			2.1	1.4	6.5	25.3	7.3	3.1	6.9	2.5	3.9	18.8	1.1	0.6	1.1	0.6		0.6
42003	26.0N	085.9W	1.1	1.2	2.3	1.2	0.7	0.1	0.2	0.4	4.2	15.6	18.4	10.3	7.1	2.4	3.0	2.1	0.1	5.5	7.2	6.6	0.9	3.6	3.2	0.3
42007	30.1N	088.0W	1.5	1.6	1.0	1.1	1.4	1.0	0.7	2.3	5.4	4.4	6.3	15.0	11.5	9.9	10.8	6.1	0.7	0.3	2.3	3.2	3.6	2.1	3.7	1.0
42039	29.3N	087.5W	0.6	0.8	1.1	1.7	2.2	1.8	1.4	1.6	3.5	2.7	6.4	8.1	8.4	12.1	10.3	4.9	0.1	0.2	2.9	6.2	1.9	1.7	3.7	1.3
42040	29.6N	088.2W	0.5	0.8	0.6	0.6	1.2	2.5	0.8	0.8	3.1	4.2	7.7	11.1	15.2	7.1	5.3	2.5	0.9	1.7	1.3	2.4	11.5	11.2	6.1	2.6
44004	38.5N	070.7W	1.4	0.3	0.5	0.8	2.2	3.1	2.5	1.2	5.2	2.3	4.0	3.4	8.0	7.6	3.8	3.2	6.7	10.9	4.2	2.5	5.7	11.3	3.5	1.1
44005	43.2N	068.9W	1.5	2.1	0.5	0.5	0.9	2.9	2.9	1.1	4.7	6.3	6.7	4.9	4.3	19.4	5.5	3.5	3.7	1.5	1.3	2.9	9.3	10.5	0.3	1.2
44007	43.5N	070.1W	2.3	1.1	1.2	1.3	1.9	3.1	2.1	0.9	7.8	4.0	3.8	3.0	3.8	10.3	3.2	3.7	2.4	1.6	1.6	0.2	6.9	7.9	0.3	0.1
44008	40.5N	069.4W	0.7	0.6	1.2	1.7	1.3	2.2	1.2	1.3	5.7	10.2	11.5	3.0	11.6	17.4	8.4	3.5	1.6	1.4	2.5	1.6	2.6	1.4	0.8	0.8
44009	38.5N	074.6W	2.3	2.5	0.9	0.6	1.9	0.9	1.5	2.5	6.3	9.6	6.9	3.2	8.1	11.6	6.5	8.8	5.4	3.1	0.1	0.1	4.9	5.9	0.2	3.6
44010	36.9N	075.7W	2.0	2.6	3.4	3.2	2.8	1.6	2.9	1.7	13.3	0.0	0.9	4.7	3.8	12.9	8.7	7.0	10.9	1.8	0.7		<.05	3.4	1.2	0.5	0.2
44011	41.1N	066.6W	0.7	1.0	1.0	0.5	0.6	0.9	0.8	0.7	2.9	1.9	2.8	2.5	5.3	9.8	12.6	7.2	5.3	6.7	3.8	0.5	0.3	1.9	1.4	0.7
44012	38.8N	074.6W	1.1	2.8	0.6	1.1	0.7	1.2	2.6	1.1	6.6	5.1	9.8	4.3	7.1	15.7	7.4	5.7	3.4	3.9	4.4	0.1	4.7	7.1	0.9	2.1
44013	42.4N	070.8W	1.9	0.8	1.2	2.3	1.0	1.2	1.4	0.8	9.2	0.8	8.3	10.9	9.2	12.9	4.4	2.0	0.1	2.6	0.2	0.3	7.7	3.0	1.0	1.0
45001	48.0N	087.6W	2.4	2.5	3.3	4.4	3.4	2.8	2.3	2.2	5.6	9.5	3.4	12.3	15.3	12.6	9.8	6.0	0.2			0.1	2.0	1.1	1.6	1.5
45002	45.3N	086.5W	2.6	1.9	1.0	2.5	1.7	2.3	2.1	1.7	6.9	5.3	2.0	3.7	9.5	10.9	9.9	5.9	0.9	1.3			12.0	10.6	2.3	4.6
45003	45.3N	082.8W	1.3	0.5	1.2	1.7	2.1	1.9	1.4	1.8	4.0	5.2	4.8	6.6	9.8	13.6	10.0	11.3	4.2	2.0	2.5	1.8	1.0	4.5	1.9	2.3
45004	47.2N	086.5W	3.6	2.0	1.7	1.7	2.6	1.8	3.9	4.7	6.8	9.1	2.1	9.2	15.7	13.5	10.3	11.0	1.1	1.1		0.5	1.1	1.5	1.1	0.1
45005	41.7N	082.5W	1.9	0.9	1.1	1.1	1.1	1.0	0.8	0.7	11.1	3.1	0.0	0.2	1.9	17.1	8.1	9.0	3.2	0.4	<.05					
45006	47.3N	090.0W	2.2	1.1	1.8	2.5	2.3	3.0	1.0	1.4	1.4	6.4	14.2	10.3	6.9	0.8	15.0	5.5	3.7	0.4	1.7	0.2	<.05	0.7	3.9	6.9	1.8
45007	42.7N	087.1W	1.3	0.9	2.1	2.1	1.4	1.6	0.7	0.8	7.4	3.8	2.4	6.9	16.0	8.9	5.7	2.5	1.0	1.9	1.1	3.3	12.1	1.2	0.9	4.0
45008	44.3N	082.4W	5.2	2.5	1.1	1.6	2.2	2.2	1.6	1.6	4.4	5.2	3.0	2.7	12.7	10.8	5.8	5.4	4.3	2.7	0.2	1.0	9.7	1.5	1.3	2.0
46001	56.3N	148.1W	0.7	1.0	1.0	0.5	0.6	0.9	0.8	0.7	2.9	1.9	2.8	2.5	5.3	9.8	12.6	7.2	5.3		0.7	1.2	7.3	0.6	0.5	1.4
46002	42.5N	130.3W	1.0	0.2	0.1	0.1	0.1	0.4	0.9	0.8	7.8	1.2		0.1	1.5	11.8	11.5	4.1	9.8	13.4	1.0		1.7	4.3	7.2	10.3
46003	51.9N	155.7W	0.9	0.9	0.2		0.1	0.3	0.7	1.3	1.6	0.8	0.8	1.5	1.5	6.0	11.1	21.0	0.9		1.2	2.0	2.0	5.6	11.7	21.2	0.6
46004	51.0N	136.0W	0.4		0.1	0.9	1.5	1.2	0.5	0.5	2.6	1.7	1.6	1.5	4.8	10.1	11.2	3.7	1.1	0.4	2.4	1.1	1.0	3.8	14.2	2.0
46005	46.1N	131.0W	0.4	<.05			0.5	0.9	1.5	0.6	5.0	0.4	0.7	0.4	1.5	4.9	12.6	14.2	10.7	0.4	0.2		4.1	8.3	12.1	7.8
46006	40.7N	137.7W	0.6	0.3	0.5		0.1	0.2	0.7	0.1	9.4	0.9	0.1	0.5	0.9	0.8	3.2	12.0	19.5	0.1		0.2	2.7	11.0	12.6	12.9
46011	34.9N	120.9W	1.2	0.5	0.1	<.05	0.2	0.0	0.7	0.2	6.0	0.5	0.1	0.1	0.1	2.0	35.2	3.4							0.1	19.6
46012	37.4N	122.7W	1.9	0.3		<.05	0.4	0.7	1.0	0.1	0.1				0.4	1.9	2.8	3.7	29.6	9.1	<.05		0.7	0.8	0.7	134.9
46013	38.2N	123.3W	0.5		0.8	1.4	0.7	1.4	5.6	3.9	0.6				0.5		0.1	2.8	12.5							6.7	143.7
46014	39.2N	124.0W	1.8	0.1	0.3	1.1	1.0	0.5	0.7	0.9	0.9	0.5	0.2	0.9	2.3	0.7	0.4	12.1	4.6			0.9	0.1			0.1	190.7
46017	60.3N	172.3W	1.5	1.4	0.4	0.4		4.1	2.6	0.5	3.3	0.9	0.7	0.7	2.8	1.6	11.2	2.5	0.5	2.0	0.1	5.4	1.3	2.9	6.3	11.8	0.9	1.2
46022	40.8N	124.5W	3.4	4.1	2.7	1.1	0.9	0.7	0.3	2.5	13.2	4.3	3.0	0.5	0.7	1.9	0.7	0.6	6.0	28.1	1.1			0.8	0.2		8.2
46023	34.3N	120.7W	0.5	0.1	0.2	0.3	0.1	0.3	0.6	0.8	3.2		0.3	0.6	0.5	0.9	2.0	7.9	5.9						0.3	147.3
46024	32.8N	119.5W	0.6		0.1	0.4	1.1	2.9	1.7	0.9	0.3			0.2	0.3	3.5	12.6	5.1	23.2					0.1	5.8	129.6
46025	33.6N	119.0W	0.1	<.05	1.0	3.6	6.8	7.5	4.8	0.7			0.4	4.2	10.4	13.1	13.3	3.1	4.7			0.1			4.6	1.4
46026	37.8N	122.7W	0.2		0.2	<.05	0.1	0.3	2.5	2.0			1.0	2.9	1.8	2.2	8.9	0.6			0.4	0.6		25.2	10.5	
46027	41.8N	124.9W	3.3	1.0	0.9	4.3	3.4	2.5	0.2	0.8	1.6	1.6	3.6	4.0	2.4	1.1	11.4	16.7	0.1		0.1	1.4			0.9	12.5
46028	35.8N	121.7W	0.4	0.1	0.2	0.6	0.2	0.1	0.2	0.8	1.0	0.3	1.6	0.3	0.1	0.2	0.8	1.9	10.4	0.3		0.1			0.3	92.7
46029	46.2N	124.2W	3.5	1.0	1.4	3.1	2.7	3.4	3.2	4.8	12.9	1.0	1.4	5.1	12.2	5.8	5.5	11.9	14.9	<.05		0.9	4.0			2.3
51001	23.4N	162.3W	1.4	1.3	1.1	0.3	1.3	0.5	0.2	0.5	0.2	9.8	18.7	4.2	0.2						6.3	50.1	4.1			
BURL1	28.9N	089.4W	0.7	0.7	2.4	7.1	4.0	3.0	2.3	2.2	1.1	2.2	4.9	13.2	13.2	4.1	7.6	9.2	2.6	0.1	0.4	6.1	2.5	3.5	3.4	2.9	0.3
CAR03	43.1N	124.4W	9.1	13.2	10.4	2.5	1.1	0.2	1.9	0.6	1.4	20.3	1.2	0.8	1.4	7.1	9.9	1.3	0.8	5.8	0.7		2.7	1.4	5.1	
CHLV2	36.9N	075.7W		0.4	0.8	1.7	0.8	1.3	0.7	3.7	3.3	3.1	4.2	1.3	4.0	6.0	4.0	4.4	3.4	17.8	1.5		7.5	16.7	1.7	3.0
CSBF1	29.7N	085.4W	3.3	9.3	3.5	3.6	3.0	3.5	1.5	4.3	1.1	1.1	3.8	8.0	12.7	10.6	10.9	9.2		0.1	0.1	0.5	4.9	0.2		
DBLN6	42.6N	079.5W	1.4	1.8	3.5	3.1	7.1	7.7	4.2	1.3	5.2	5.5	3.1	7.7	16.2	11.0	3.1	7.9	3.2	2.8	1.3		8.2	2.7	1.1	
DESW1	47.7N	124.5W	1.6	1.2	2.3	1.4	3.1	3.9	2.7	12.6	1.1	6.9	4.0	5.8	3.2	0.2	15.1	3.2			2.8	3.1	0.1		10.0	
DISW3	47.1N	090.7W	3.2	2.3	2.4	2.1	2.5	1.6	1.6	0.5	4.4	11.9	7.4	4.5	13.1	7.4	1.7	0.9	1.6	7.4	1.7	0.2	2.3	10.4	4.0	2.0
FBIS1	32.7N	079.9W	3.9	0.7	0.6	1.0	1.0	0.8	0.2	3.8	4.4	4.1	5.0	4.1	17.4	9.9	4.3	0.5	1.4	0.1	2.4	0.3	2.7	11.6	0.5	
FFIA2	57.3N	133.6W	4.4	3.0	2.6	3.0	0.8	0.9	3.8	4.3	12.1	4.7	2.6	4.5	6.9	2.2	1.5	1.8	7.2	<.05	0.4	10.4	4.1	0.6	0.1	<.05
GLLN6	43.5N	076.3W	2.2	2.1	2.0	1.7	2.5	3.4	3.4	2.2	4.2	9.0	2.5	3.8	4.9	11.8	9.2	3.2	0.9	0.8		1.4	10.9	4.2	7.3	2.2
LKWF1	26.7N	080.0W	1.4	0.9	1.8	1.5	1.5	0.9	0.3	2.9	1.5	0.3	13.8	17.7	10.6	4.3	1.4	1.7	0.5	3.3	3.3	6.4	3.7			0.2
MDRM1	44.0N	068.1W									2.2				2.5	7.1	6.3	3.1				3.2	10.6	12.4	7.1	2.6
NWP03	48.8N	124.1W	7.8	2.9	10.5	0.8	5.9	0.1	5.7	4.3	12.9	0.9	5.6	0.2	6.9	7.3	1.7	7.6	10.3			1.3	1.5			1.0
PILM1	48.2N	088.4W	1.5	0.7	2.7	1.8	2.4	2.4	1.2	1.6	6.1	4.0	8.1	10.4	10.2	7.6	4.0	4.4	0.6	1.9	0.5	2.3	11.1	7.5	5.3	0.5
PTAT2	27.8N	097.1W		0.7	0.2	0.6	0.7	0.4	0.2		0.6	1.3	7.4	15.3	8.1	0.8					0.5	9.7	13.4	10.1	1.6	0.5
PTGC1	34.6N	120.7W	1.8	0.1		<.05	0.2	0.3	0.2	0.9	25.0	0.1		<.05	1.9	0.3	0.2	3.1	49.4				11.4	<.05		0.8
ROAM4	47.9W	089.3W	1.6	2.0	1.8	1.8	2.6	2.6	1.6	1.3	3.2	5.3	3.9	5.6	7.0	7.5	3.9	2.9	3.9	4.9	1.0	4.4	3.3	13.3	1.1	9.9
SBIO1	41.7N	082.8W	4.7	4.6	3.3	1.3	2.4	4.2	2.3	2.9	8.7	6.2	7.9	9.8	9.0	12.1	5.3	3.9	2.0	0.2	0.1		1.6	9.3	5.7	2.7
SDHN3	43.8N	087.7W	1.0	1.6	1.2	1.1	1.0	0.7	0.5	0.4	8.2	0.0	1.5	13.2	9.0	8.1	2.0	1.7	4.9	4.7	0.1	1.2	11.4	2.1	1.3	5.2
SISW1	48.3N	122.9W	0.5	0.3	0.9	0.9	1.5	0.4	0.5	3.2	0.4		0.1	1.3	1.8	6.6	13.7	20.1	4.8			0.2	0.1	1.8	1.4	<.05
SJLF1	30.4N	081.4W	0.2	0.3	0.7	0.6	0.8	1.4	1.4	1.3	1.3	3.9	10.7	11.1	5.1	9.0	12.9	15.3	4.7	1.0	0.9	1.8	2.5	5.6	4.1	<.05
SPST2	29.7N	094.1W	2.7	1.6	0.1	0.3	0.8	0.6	0.5	1.9	4.1	3.5	1.7	5.1	17.8	8.7	7.1	9.4	9.1	1.0	0.2	<.05	0.6	5.9	12.0	4.1
STDM4	47.2N	087.2W	1.1	1.2	0.5	1.1	0.6	0.4	1.7	1.0	4.3	3.1	5.8	5.4	7.2	5.8	3.5	2.0	7.4	8.2	1.6	1.1	6.4	6.1	4.1	5.9
TTIA1	48.3N	124.7W	2.4	2.7	0.9	0.3	3.7	9.1	1.5	1.3	0.9	3.4	2.7	0.3	12.6	11.7	9.5	9.4	1.0		0.1	0.4	0.9	11.4	4.3	2.0
WPOW1	47.7N	122.4W	4.6	15.1	1.1	3.8	11.0	1.1	0.6	0.4	0.8	10.1	23.5	1.0	0.8	3.0	16.5	0.7		<.05	0.9	2.9		0.9	4.2	<.05

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BUOY	LAT	LONG	% FREQUENCY OF WIND SPEEDS (22- 33 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (34-47 KTS) N	NE	E	SE	S	SW	W	NW	% FREQUENCY OF WIND SPEEDS (>47 KTS) N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		0.1				1.7	0.5	0.3																		
41002	32.3N	075.3W																										
41006	29.3N	077.3W	0.1						0.1	<.05																		
42001	25.9N	089.7W			1.4	1.3	1.5																					
42002	26.0N	093.5W					0.2		0.4																			
42003	26.0N	085.9W	0.1		0.1	0.1																						
42007	30.1N	088.9W																										
42039	29.3N	087.5W				0.2		0.2																				
42041	29.6N	093.5W			0.2	0.2			0.4			0.2																
44004	38.5N	070.7W			0.1		1.4	0.1																				
44005	42.7N	068.3W																										
44007	43.5N	070.1W																										
44008	40.5N	069.4W																										
44009	38.5N	074.6W																										
44010	36.9N	075.7W																										
44011	41.1N	066.6W																										
44012	38.8N	074.6W																										
44013	42.4N	070.8W																										
45001	48.0N	087.6W																										
45002	45.3N	086.5W																										
45003	45.3N	082.8W							0.1																			
45004	47.2N	086.5W																										
45005	41.7N	082.5W								0.3																		
45006	47.3N	090.0W																										
45007	42.7N	087.1W								0.3																		
45008	44.3N	082.4W																										
46001	56.3N	148.1W						3.3	3.1	1.8																		
46002	42.5N	130.3W																										
46003	51.9N	155.7W					1.3	2.3	0.7																			
46004	51.0N	136.0W							0.9	0.2																		
46005	46.1N	131.0W				0.1	0.9	0.1																				
46006	40.7N	137.7W	2.2	2.2				0.1																				
46011	34.9N	120.9W							3.8																			
46012	37.4N	122.7W							0.1																			
46013	38.2N	123.3W						9.7	9.7																			
46014	39.2N	124.0W	0.3						110.8																			
46017	60.3N	172.3W	1.8	2.1	1.3	0.9	1.2	0.9		0.7											0.1	0.3						
46022	40.8N	124.5W	0.2							<.05																		
46023	34.3N	120.7W	2.2							26.8						0.3												
46024	32.4N	119.5W								2.7																		
46025	33.6N	119.0W																										
46026	37.8N	122.7W							0.2	0.2																		
46027	41.8N	124.9W							0.9	2.6																		
46028	35.8N	121.7W							0.2	20.3																		
46029	46.2N	124.2W																										
51001	23.4N	162.3W																										
BURL1	28.9N	089.4W							0.1																			
CAR03	43.1N	124.4W																										
CHLV2	36.9N	075.7W						0.4																				
CSBF1	29.7N	085.4W																										
DBLN6	42.6N	079.5W		0.1																								
DESW1	47.7N	124.5W				0.6	0.8			0.9																		
DISW3	47.1N	090.7W						0.1	0.1	0.1																		
FBIS1	32.7N	079.9W																										
FFIA2	57.3N	133.6W				2.7	0.1																					
GLLN6	43.5N	076.3W							0.4																			
LKWF1	26.7N	080.0W																										
MDRM1	44.0N	068.1W																										
NWP03	48.8N	124.1W	0.8																									
PILM1	48.2N	088.4W						0.3	0.6	0.3																		
PTAT2	27.8N	097.1W				0.1																						
PTGC1	34.6N	120.7W	19.5																									
ROAM4	47.9W	089.3W	0.4	0.3			0.1	0.4	2.1	0.6																		
SBIO1	41.7N	082.8W							0.1	0.2																		
SDHN3	43.8N	087.7W						0.1		0.1	0.1																	
SISW1	48.3N	122.9W							0.3	0.8																		
SJLF1	30.4N	081.4W	0.1		0.1																							
SPST2	29.7N	094.1W																										
STDM4	47.2N	087.2W	1.5	0.1			0.5	2.9	0.6	0.5	0.1																	
TTIA1	48.3N	124.7W						0.8																				
WPOW1	47.7N	122.4W						0.1																				

SEPTEMBER 1984			AIR TEMPERATURE (DEG C)							SEA TEMPERATURE (DEG C)							AIR-SEA TEMPERATURE DIFFERENCE (DEG C)						
BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN
41001	34.9N	072.9W	530	23	26.9	03 20	19.8	16 22	24.2	530	23	26.9	03 23	25.1	18 06	26.0	533	24	00.5	15 02	-05.7	16 22	-01.8
41002	32.3N	075.3W	717	30	27.9	04 22	21.7	19 19	25.4	717	30	27.7	16 18	25.9	28 18	26.5	717	30	00.6	04 22	-04.9	19 19	-01.2
41006	29.3N	077.3W	650	30	28.9	01 21	22.2	08 09	26.5	650	30	29.8	15 21	26.1	30 03	27.6	650	30	00.9	15 14	-05.9	08 09	-01.1
42001	25.9N	089.7W	244	11	28.0	22 18	23.7	30 23	27.4	400	30	29.6	01 21	28.2	18 00	28.8	244	11	-00.1	22 16	-04.5	30 23	-01.2
42002	26.0N	093.5W	427	30	29.5	22 19	22.7	30 23	27.1	427	30	30.2	22 21	27.5	05 03	28.4	427	30	00.5	22 14	-06.3	05 00	-01.3
42003	26.0N	085.9W	717	30	28.0	03 04	23.0	05 21	26.9	717	30	30.1	04 21	26.9	27 12	28.3	717	30	00.4	27 08	-06.8	05 21	-01.4
42007	30.1N	088.9W	715	30	29.7	14 22	15.3	30 14	25.8	715	30	29.7	01 21	24.0	30 16	26.4	716	30	02.4	22 09	-09.1	30 14	-01.0
42009	29.3N	087.5W	238	30	29.4	01 21	20.2	30 19	26.1	238	30	31.8	03 21	26.8	30 03	28.2	238	30	-00.2	11 15	-06.8	30 18	-02.0
44004	38.5N	070.7W	702	30	23.2	04 07	13.1	17 05	18.5	706	30	25.7	03 19	21.8	30 12	23.8	706	30	-01.6	15 06	-11.5	17 05	-05.2
44005	42.7N	068.3W	035	02	20.4	01 21	16.7	01 07	18.4	035	02	20.2	01 01	17.9	02 10	19.6	036	02	00.5	01 21	-03.4	01 07	-01.2
44007	43.5N	070.1W	687	30	21.5	24 19	06.9	27 12	14.4	687	30	17.3	06 20	12.6	27 12	14.6	692	30	07.7	24 09	-05.8	16 10	-00.2
44008	40.5N	069.4W	710	30	22.0	04 12	10.8	27 23	17.8	710	30	20.6	03 20	13.7	16 08	17.8	711	30	07.1	01 04	-06.6	27 23	-00.8
44009	38.5N	074.6W	666	30	26.5	03 18	17.0	28 05	20.0	661	30	24.5	03 19	18.2	30 16	21.1	698	30	02.3	03 18	-07.6	28 05	-01.2
44010	36.9N	075.7W	716	30	28.5	03 22	15.8	16 17	21.3	716	30	26.9	03 20	19.8	30 19	22.5	716	30	03.2	03 22	-07.0	16 12	-01.2
44011	41.1N	066.6W	716	30	22.5	05 12	10.7	27 22	16.7	716	30	23.4	05 11	13.5	30 13	16.9	716	30	05.2	15 16	-07.7	07 23	-00.2
44012	38.8N	074.6W	708	30	26.4	03 21	11.2	28 05	19.6	709	30	24.5	03 21	18.2	29 07	21.0	715	30	02.3	03 17	-07.6	28 05	-01.4
44013	42.4N	070.8W	711	30	25.7	24 19	07.0	27 11	15.7	708	30	18.0	24 20	13.6	26 17	15.4	715	30	09.1	24 19	-07.3	27 11	00.3
45001	48.0N	087.6W	393	18	14.4	07 02	06.0	28 11	11.6	393	18	13.5	01 11	08.3	29 12	11.3	393	18	03.9	08 04	-02.7	27 17	00.3
45002	45.3N	086.3W	717	30	20.9	08 05	07.0	26 10	14.7	717	30	18.0	01 04	14.8	30 07	16.2	717	30	04.2	08 05	-08.1	26 10	-01.5
45003	45.3N	082.8W	717	30	18.6	23 07	06.0	26 19	14.0	717	30	19.2	01 19	11.9	30 15	15.1	717	30	03.6	23 07	-06.6	26 10	-01.1
45004	47.2N	086.5W	717	30	16.8	08 07	03.8	26 08	11.8	717	30	13.7	05 20	07.4	29 04	11.6	717	30	04.5	08 07	-06.3	26 00	00.2
45005	41.7N	082.5W	715	30	26.0	03 00	09.5	28 10	17.9	715	30	23.3	02 19	18.2	30 20	20.5	715	30	03.9	22 22	-09.8	26 13	-02.6
45006	47.3N	090.0W	702	30	20.4	08 01	02.9	25 20	12.7	703	30	17.9	01 01	09.5	27 13	13.4	703	30	05.8	19 02	-07.0	25 20	-00.7
45007	42.7N	087.1W	717	30	25.4	02 05	07.2	26 11	17.1	717	30	21.8	01 02	16.1	29 12	18.7	717	30	04.3	02 05	-09.9	26 11	-01.6
45008	44.3N	082.4W	716	30	19.9	09 00	07.4	26 16	14.8	716	30	20.5	01 20	13.5	16 08	15.9	716	30	04.0	25 01	-07.8	26 16	-01.0
46001	56.3N	148.3W	717	30	12.9	11 01	09.6	21 04	11.6	717	30	12.7	11 01	11.5	30 14	12.1	717	30	00.7	30 20	-02.2	21 04	-00.4
46002	42.5N	130.3W	717	30	19.3	17 23	14.8	11 16	17.0	717	30	19.5	02 01	17.6	24 15	18.1	717	30	00.5	17 17	-03.1	11 16	-01.1
46003	51.9N	155.7W	718	30	13.3	07 20	09.8	12 03	11.7														
46004	51.0N	136.0W	716	30	14.4	02 20	09.8	24 16	13.1	716	30	13.8	01 23	12.6	14 06	13.2	716	30	01.3	14 06	-03.4	24 16	-00.1
46005	46.1N	131.0W	717	30	17.2	16 20	12.7	11 06	15.1	717	30	17.4	13 00	15.5	24 09	16.0	717	30	01.0	16 20	-03.3	05 14	-00.9
46006	40.7N	137.7W	715	30	20.4	27 22	14.1	29 05	18.2	717	30	21.0	27 00	18.9	18 17	19.9	717	30	00.7	16 21	-06.4	29 05	-01.7
46010	46.2N	124.2W	699	30	23.7	14 23	08.8	24 16	14.7	699	30	17.3	05 02	10.9	23 14	14.7	701	30	07.0	14 23	-03.4	22 20	00.1
46011	34.9N	120.9W	717	30	21.6	10 08	14.1	03 15	17.9	717	30	20.8	14 21	14.3	01 18	18.2	717	30	03.3	26 21	-03.7	24 08	-00.3
46012	37.4N	122.7W	716	30	19.4	25 16	13.0	28 16	15.6	716	30	17.3	09 01	14.1	24 04	15.1	716	30	05.1	25 16	-01.9	29 11	00.4
46013	38.2N	123.3W	717	30	16.2	19 20	09.5	28 15	13.7	717	30	15.3	19 22	11.7	02 15	13.1	717	30	02.8	08 00	-03.8	28 15	00.6
46014	39.2N	124.0W	717	30	16.5	18 22	09.8	29 11	13.7	717	30	15.1	15 23	11.1	24 12	13.1	717	30	03.2	08 02	-04.2	29 11	00.6
46016	63.3N	170.3W	097	13	10.3	29 00	01.0	19 09	05.9														
46017	60.3N	172.3W	238	30	10.6	06 00	03.1	19 09	07.7														
46018	60.3N	177.0W	072	11	09.0	26 00	05.4	30 21	07.8														
46022	40.8N	124.5W	717	30	17.9	19 20	09.6	27 16	13.6	717	30	16.0	16 00	10.8	23 13	13.1	717	30	04.7	19 20	-03.2	13 20	00.5
46023	34.3N	120.7W	714	30	25.0	10 21	15.3	03 11	18.5	714	30	23.5	10 22	15.7	01 14	18.7	715	30	05.3	09 20	-03.5	14 17	-00.2
46024	32.8N	119.5W	715	30	24.4	09 22	17.6	08 13	20.1	715	30	22.6	09 23	19.6	01 15	20.9	715	30	02.2	09 22	-03.2	08 13	-00.7
46025	33.6N	119.0W	716	30	24.3	08 21	19.1	22 10	21.4	716	30	23.6	01 23	19.6	27 03	21.9	716	30	02.0	09 22	-02.7	02 04	-00.4
46026	37.8N	122.7W	717	30	20.3	25 12	12.1	03 18	14.8	717	30	17.3	18 21	12.4	07 09	15.1	717	30	06.0	25 12	-03.7	17 08	-00.3
46027	41.8N	124.4W	716	30	18.8	19 20	08.6	26 15	12.4	716	30	14.1	05 00	09.3	24 13	11.3	717	30	06.7	19 19	-02.1	17 18	01.1
46028	35.8N	121.7W	718	30	20.8	09 00	13.6	03 14	16.6	718	30	18.7	14 00	15.3	07 02	17.0	718	30	04.1	08 23	-02.5	03 14	-00.4
46029	46.2N	124.2W	715	30	20.2	15 00	08.9	24 16	14.8	715	30	16.9	14 01	10.9	22 15	14.4	715	30	04.4	28 23	-02.4	11 13	00.4
46031	55.5N	161.7W	027	04	11.8	28 03	06.4	29 12	09.1														
46032	54.2N	165.8W	025	04	09.2	27 21	06.2	29 15	07.9	025	04	08.1	28 00	07.3	27 12	07.4	025	04	01.9	27 21	-01.1	29 15	00.5
46033	55.8N	159.6W	027	04	10.9	29 00	07.7	29 15	09.3	027	04	10.0	29 03	07.9	27 18	09.1	028	04	01.2	28 00	-01.6	30 09	00.2
46034	55.1N	163.1W	028	04	11.0	27 22	07.9	30 19	09.4	028	04	10.3	28 01	09.8	27 16	10.1	028	04	00.8	27 22	-02.3	30 19	-00.8
51001	23.4N	162.3W	716	30	27.4	23 04	24.0	17 13	26.3	716	30	29.1	23 02	27.0	03 15	27.3	717	30	-00.3	03 18	-03.1	16 04	-01.0
51002	17.2N	157.8W	576	25	26.9	23 03	22.9	08 22	26.1	576	25	27.4	20 01	26.1	09 17	26.7	576	25	00.4	11 03	-03.4	08 22	-00.5
BURL1	28.9N	089.4W	705	30	31.2	01 16	19.9	30 22	26.6														
CARO3	43.1N	124.4W	716	30	19.9	28 20	08.7	24 14	13.7														
CHLV2	36.9N	075.7W	713	30	29.3	03 22	15.1	16 12	20.9	712	30	25.3	04 01	19.7	30 21	22.4	715	30	04.8	03 22	-07.4	16 11	-01.5
CSBF1	29.7N	085.4W	704	30	29.9	27 21	19.7	17 14	25.2														
DBLN6	42.6N	079.5W	709	30	26.4	08 20	05.8	28 10	16.5														
DESW1	47.7N	124.5W	716	30	22.6	15 02	07.5	23 13	13.5														
DISW3	47.1N	090.7W	716	30	25.3	07 20	03.5	25 19	12.6														
FBIS1	32.7N	079.9W	678	30	31.3	12 22	16.6	18 10	23.2														
FFIA2	57.3N	133.6W	717	30	14.4	13 22	06.2	25 11	09.9														
GLLN6	43.5N	076.3W	715	30	21.6	09 20	07.5	27 05	15.6														
IOSN3	42.9N	070.6W	299	14	24.2	23 22	06.3	27 11	13.3														
LKWF1	26.7N	080.0W	624	27	31.2	10 21	22.2	19 17	26.6	624	27	29.5	03 22	25.9	27 11	27.8	625	27	02.7	10 21	-05.4	11 11	-01.3
MDRM1	44.0N	068.1W	717	30	17.7	24 22	06.2	27 12	13.1														
MISM1	43.8N	068.9W	225	10	17.4	24 11	06.2	27 14	12.6														
NWPO3	44.6N	124.1W	706	30	25.1	28 23	05.9	23 14	13.3														
PILM4	48.2N	088.4W	716	30	18.9	19 00	02.2	25 20	11.7														
PTAT2	27.8N	097.1W	683	30	28.3	01 21	18.9	29 08	25.9														
PTGC1	34.6N	120.7W	685	30	25.4	09 22	13.5	04 05	17.9														
ROAM4	47.9N	089.3W	716	30	19.7	19 01	02.2	25 20	11.7														
SBIO1	41.7N	082.8W	715	30	27.0	22 22	08.5	28 02	17.3														
SGNW3	43.8N	087.7W	716	30	23.8	13 09	02.7	29 10	14.0														
SISW1	48.3N	122.9W	712	30	19.3	16 22	07.4	22 17	12.3														
SJLF1	30.4N	081.4W	716	30	33.1	13 17	17.6	29 12	25.0														
SRST2	29.7N	094.1W	657	30	31.1	15 19	18.9	05 09	25.4														
STDM4	47.2N	087.2W	716	30	18.0	08 06	03.5	26 05	12.2														
TTIW1	48.3N	124.7W	716	30	19.3	15 01	08.7	13 15	12.7														
WPOW1	47.7N	122.4W	716	30	21.5	03 23	07.9	24 14	13.7														

SEPTEMBER 1984			PRESSURE (MB)							WIND SPEEDS (KNOTS)				MEAN WIND SPEED (KNOTS)								
BUOY	LAT	LONG	OBS	DAYS	MAX	DY HR	MIN	DY HR	MEAN	OBS	MAX	DY HR	DIR	N	NE	E	SE	S	SW	W	NW	TOTAL
41001	34.9N	072.9W	530	23	1029.2	08 16	1010.1	15 00	1018.8	529	36	15 02	230	17.0	17.9	19.3	18.4	14.2	15.8	16.4	9.0	16.5
41002	32.3N	075.3W	717	30	1024.4	23 15	1005.4	30 02	1017.1	712	29	29 23	210	10.3	14.5	13.3	14.5	16.0	12.5	9.9	11.9	13.7
41006	29.3N	077.3W	650	30	1021.8	23 04	1011.6	10 21	1016.3	634	38	08 15	060	7.1	17.1	13.7	8.7	12.5	10.4	9.1	6.8	13.5
42001	25.9N	089.7W	243	11	1019.7	30 16	1005.9	20 22	1014.7	400	27	17 15	100	15.2	15.1	15.3	13.8	12.1	6.9	5.4	8.8	14.7
42002	26.0N	093.5W	427	30	1022.3	30 17	1002.5	20 22	1013.9	424	30	02 06	160	15.7	14.1	13.0	12.7	12.9	7.4	4.6	5.2	13.1
42003	26.0N	085.9W	717	30	1020.1	08 16	1006.3	20 20	1014.7	714	31	17 13	100	10.8	12.7	13.6	10.9	8.0	5.7	6.3	7.0	12.5
42007	30.1N	088.9W	716	30	1021.7	08 17	1008.8	21 09	1016.9	706	22	19 06	070	11.0	14.8	14.2	12.2	6.6	6.0	5.6	5.5	11.4
42009	29.3N	087.5W	238	30	1021.4	08 15	1008.8	21 09	1016.2	223	25	19 06	060	9.4	15.2	15.7	7.6	2.7	5.1	5.4	7.3	12.0
44004	38.5N	070.7W	699	30	1033.2	08 14	994.2	15 11	1019.2	702	35	15 09	090	17.4	17.8	16.4	13.8	12.3	12.4	12.3	14.7	15.0
44005	42.7N	068.3W	035	02	1012.7	02 04	1007.2	01 00	1009.8	035	20	02 02	310	5.5						13.0	13.2	12.5
44007	43.5N	070.1W	688	30	1033.5	08 14	997.3	20 22	1018.7	661	21	20 22	200	8.8	7.3	3.8	5.2	12.2	10.9	7.7	8.9	09.6
44008	40.5N	069.4W	710	30	1033.7	08 15	1002.1	15 15	1018.9	706	21	29 09	050	10.0	11.6	11.3	6.5	8.7	11.1	8.3	7.8	09.7
44009	38.5N	074.6W	655	30	1033.3	08 15	1007.5	03 23	1020.3	662	27	16 00	320	13.9	14.5	8.9	7.1	9.8	11.8	9.2	11.2	11.5
44010	36.9N	075.7W	716	30	1031.8	08 16	1007.1	14 22	1019.8	709	24	14 20	030	13.9	13.9	9.6	8.7	8.6	9.4	6.7	8.7	11.3
44011	41.1N	066.6W	715	30	1032.7	08 16	992.0	15 19	1018.6	707	32	15 19	340	12.7	12.2	11.0	7.0	5.8	8.1	9.0	10.3	10.5
44012	38.8N	074.6W	706	30	1032.6	08 14	1007.8	15 09	1020.3	707	29	16 02	010	12.6	13.6	13.9	8.5	8.7	10.6	9.5	9.4	11.5
44013	42.4N	070.8W	709	30	1032.9	08 14	1000.2	20 22	1018.5	712	23	15 15	030	9.8	10.2	5.2	7.4	9.4	9.1	6.9	10.9	09.1
45001	48.0N	087.6W	393	18	1026.9	05 15	1002.7	07 21	1016.2	390	17	07 15	180	4.0	6.6	6.5	10.3	7.7	7.6	8.9	6.6	07.7
45002	45.3N	086.3W	717	30	1030.3	26 18	1001.5	20 06	1017.1	715	26	13 03	190	11.8	11.0	11.8	11.7	15.6	12.7	10.1	11.4	12.4
45003	45.3N	082.8W	717	30	1029.6	27 08	999.4	20 08	1017.8	710	27	26 03	300	8.6	11.0	10.8	11.2	13.0	9.1	8.5	11.8	10.8
45004	47.2N	086.5W	717	30	1028.8	27 05	999.2	20 04	1016.7	560	20	24 15	100	7.6	7.3	8.8	11.7	10.3	9.0	9.8	10.6	09.8
45005	41.7N	082.5W	715	30	1032.6	17 14	1007.6	03 00	1019.5	699	11	26 02	290	4.6	4.3	3.7	3.2	4.6	5.1	4.7	4.8	04.5
45006	47.3N	090.0W	703	30	1030.8	26 17	1000.2	07 21	1016.8	695	19	24 20	050	7.5	9.3	8.9	9.1	7.1	10.1	10.4	8.5	09.3
45007	42.7N	087.1W	717	30	1032.6	26 17	1006.2	20 08	1018.5	714	26	07 15	170	11.2	7.9	8.9	12.2	12.7	10.3	7.9	11.8	11.1
45008	44.3N	082.4W	716	30	1031.0	17 14	1001.8	20 11	1018.3	711	22	07 19	170	8.5	7.3	7.0	9.8	11.8	8.8	7.7	9.5	09.4
46001	56.3N	148.3W	717	30	1026.7	22 07	982.2	30 23	1008.0	710	27	13 20	080	12.0	11.2	11.9	12.5	8.9	9.3	9.6	9.7	10.8
46002	42.5N	130.3W	717	30	1025.5	24 18	1009.4	05 12	1018.3	703	22	29 23	300	12.4	10.9	7.9	6.1	8.6	8.1	11.4	13.3	11.1
46003	51.9N	155.7W	718	30	1024.6	19 20	974.7	30 17	1007.9	718	36	30 15	200	10.5	13.2	17.1	16.9	12.7	14.5	16.3	13.0	14.3
46004	51.0N	136.0W	716	30	1029.5	19 11	996.1	07 14	1013.1	716	26	13 21	130	7.8	9.0	11.4	15.5	13.4	11.7	12.7	10.9	12.0
46005	46.1N	131.0W	717	30	1027.7	18 21	1008.4	05 13	1017.7	716	28	07 18	240	16.6	11.9	7.1	11.0	14.6	14.3	14.3	14.9	14.1
46006	40.7N	137.7W	717	30	1028.1	24 11	1010.9	15 12	1019.8	715	24	18 19	080	10.5	9.8	11.9	11.2	14.1	12.7	11.7	11.8	11.9
46010	46.2N	124.2W	700	30	1025.5	27 18	1006.6	05 18	1016.7	672	24	05 18	190	10.1	6.9	10.0	5.5	11.0	6.9	5.5	9.1	09.0
46011	34.9N	120.9W	717	30	1018.0	27 18	1002.9	22 01	1012.0	707	25	06 21	320	6.1	4.8	2.8	3.8	5.0	3.1	5.5	10.8	08.8
46012	37.4N	122.7W	715	30	1018.0	29 18	1003.0	22 03	1012.2	716	25	07 02	330	11.2	6.0	3.7	2.8	4.3	4.5	6.0	10.1	09.8
46013	38.2N	123.3W	717	30	1018.2	29 17	1002.9	11 03	1011.8	698	28	23 01	310	5.6	2.3	2.9	1.7	2.8	3.6	5.2	13.1	12.1
46014	39.2N	124.0W	717	30	1018.6	29 18	1002.6	11 02	1012.9	708	32	11 02	320	9.4	3.9	6.0	5.2	4.7	4.8	7.6	15.2	12.8
46016	63.3N	170.3W	097	13	1021.3	27 09	980.3	30 15	1010.7	096	26	23 12	130	9.3	16.3	12.3	16.2	6.6	14.3	13.3	12.0	13.8
46017	60.3N	172.3W	238	30	1022.4	20 09	989.2	23 12	1006.8	237	24	30 18	360	14.3	11.6	13.5	13.2	12.1	11.5	10.1	8.1	12.4
46018	60.3N	177.0W	072	11	1021.0	27 00	987.9	23 15	1007.7	072	28	30 21	350	23.8	18.9	17.1	17.2	18.2	24.4			18.5
46022	40.8N	124.5W	717	30	1022.1	01 05	1008.2	22 11	1015.4	701	25	21 17	340	9.7	5.0	2.9	4.7	10.2	9.0	4.7	10.9	09.3
46023	34.3N	120.7W	714	30	1018.3	27 18	1003.1	22 01	1011.7	686	30	20 22	310	11.8	4.9	4.5	5.9	5.4	4.8	8.0	16.2	14.0
46024	32.8N	119.5W	715	30	1017.2	27 18	1002.8	22 01	1010.6	695	25	20 11	300	5.3	3.4	8.2	7.4	3.5	4.1	9.4	12.0	09.9
46025	33.6N	119.0W	716	30	1016.1	27 17	1001.3	22 01	1009.5	677	22	21 02	280	3.9	2.7	5.1	5.1	4.2	4.2	7.5	6.0	05.9
46026	37.8N	122.7W	717	30	1018.9	29 18	1003.4	22 03	1012.8	693	21	07 00	290	2.8	5.4	3.0	1.8	4.5	5.7	9.0	10.3	08.7
46027	41.8N	124.4W	714	30	1021.8	01 05	1007.2	11 03	1016.0	717	31	11 01	300	2.8	1.6	5.3	8.2	3.8	2.2	11.5	14.5	10.8
46028	35.8N	121.7W	718	30	1017.9	27 18	1003.8	22 03	1012.5	714	28	07 02	310	5.2	2.2	9.0	5.4	2.0	3.8	8.2	12.8	11.9
46029	46.2N	124.2W	715	30	1025.2	27 18	1006.5	05 18	1016.5	699	22	05 15	160	9.6	7.8	8.1	5.0	10.5	5.6	4.8	8.5	08.3
46031	55.5N	161.7W	028	04	1012.9	27 21	978.7	30 15	1000.6	027	23	30 21	360	10.2	2.8			5.7	4.1	1.0	5.5	06.5
46032	54.2N	165.8W	025	04	1011.2	27 21	986.1	30 12	1000.4	025	27	30 18	310	8.3	6.0	8.0	8.9	8.0	8.0	7.7	19.2	10.5
46033	55.8N	159.6W	027	04	1014.2	28 06	976.3	30 18	1002.0	027	26	30 21	340	12.0	8.7	8.5	9.0		9.0		10.2	09.9
46034	55.1N	163.1W	028	04	1012.5	27 19	982.3	30 13	1000.9	028	26	30 16	320	14.0	11.6		11.2	7.3		5.5	21.1	12.2
51001	23.4N	162.3W	716	30	1020.0	09 22	1012.1	22 03	1016.5	704	16	09 09	110	4.7	6.7	9.2	7.4	3.8	3.4	3.0	1.6	08.4
51002	17.2N	157.8W	576	25	1016.7	07 09	1010.2	27 02	1013.6	576	22	08 22	090		10.2	12.3	11.0					12.1
BURL1	28.9N	089.4W	715	30	1022.1	08 15	1007.3	21 09	1016.8	717	30	19 21	030	14.0	16.5	14.1	4.1	3.5	5.2	6.6	13.5	12.4
CARO3	43.1N	124.4W	716	30	1023.6	24 17	1010.4	11 11	1016.9	715	27	29 20	200	8.8	5.8	2.4	3.0	8.7	7.4	2.6	3.7	06.4
CHLV2	36.9N	075.7W								713	35	30 05	060	14.0	18.2	16.1	12.0	11.9	12.4	11.8	8.3	14.8
CSBF1	29.7N	085.4W	716	30	1023.6	08 14	1011.1	20 21	1017.0	715	12	08 06	080	3.4	4.6	7.2	4.8	4.8	4.5	6.9	3.6	05.3
DBLN6	42.6N	079.5W	709	30	1033.2	17 14	1005.0	20 16	1020.0	709	31	26 05	300	9.1	8.1	5.2	5.7	5.5	11.1	9.5	9.6	07.7
DESW1	47.7N	124.5W	716	30	1027.3	27 18	1006.8	11 12	1016.5	716	24	18 22	320	6.7	7.4	4.9	9.3	10.2	5.6	4.2	10.4	08.1
DISW3	47.1N	090.7W	716	30	1030.8	26 17	999.0	07 20	1016.5	716	30	25 00	010	10.1	10.5	12.4	7.1	7.7	12.1	11.7	11.1	11.3
FBIS1	32.7N	079.9W	714	30	1025.8	08 15	1007.4	11 09	1017.5	716	28	29 03	080	8.6	14.5	8.9	5.9	5.8	9.6	4.3	4.7	10.2
FFIA2	57.3N	133.6W	717	30	1028.1	27 19	995.9	16 16	1013.9	717	28	15 03	140	8.4	4.0	4.0	12.5	6.5	3.1	1.7	4.3	07.2
GLLN6	43.5N	076.3W	715	30	1032.1	17 14	1001.6	20 15	1019.1	715	28	26 09	300	5.1	7.2	6.8	8.4	15.0	10.9	11.2	9.1	10.4
IOSN3	42.9N	070.6W	299	14	1030.0	18 06	1006.2	26 12	1020.9	299	27	27 02	320	10.7	8.6	6.5	9.7	12.1	10.7	8.6	13.5	10.8
LKWF1	26.7N	080.0W	624	27	1019.2	23 16	1003.0	27 13	1014.8	624	29	26 22	010	15.5	15.7	13.1	8.2	12.9	5.8	3.7	3.3	11.3
MDRM1	44.0N	068.1W	717	30	1032.9	08 14	997.8	20 23	1017.5	717	29	15 19	030	11.5	10.0	4.1	6.2	14.5	13.5	10.0	12.0	11.8
MISM1	43.8N	068.9W	225	10	1027.6	27 14	1005.4	26 14	1019.9	225	27	26 10	220	12.5	8.8	4.3	3.4	8.5	14.0	11.2	14.2	11.0
NWPO3	44.6N	124.1W	706	30	1024.3	24 18	1009.4	11 12	1016.8	706	24	07 04	190	8.6	3.5	4.9	2.3	7.1	6.7	3.3	4.5	06.2
PILM4	48.2N	088.4W	715	30	1027.7	27 04	1001.3	07 20	1016.3	716	32	27 00	290	5.1	11.9	14.1	16.0	12.8	13.6	16.0	10.9	12.9
PTAT2	27.8N	097.1W	717	30	1027.6	30 16	1002.4	21 21	1015.6	716	28	16 11	010	15.9	13.3	10.8	13.0	10.9	6.5	7.1	11.7	13.1
PTGC1	34.6N	120.7W	685	30	1017.6	27 17	1003.2	22 00	1011.3	687	28	20 07	350	13.5	5.5	1.0	4.2	4.4	2.1	2.1	6.4	11.9
ROAM4	47.9N	089.3W	716	30	1028.8	26 17	1001.0	07 21	1016.7	716	31	22 02	120	11.2	12.7	12.1	16.1	12.6	15.3	14.5	12.8	13.8
SBIO1	41.7N	082.8W	715	30	1033.1	17 14	1007.7	02 23	1019.6	715	34	26 05	310	5.4	4.3	6.8	10.3	10.3	10.2	9.8	11.9	08.9
SGNW3	43.8N	087.7W	717	30	1032.4	26 17	1004.7	20 06	1018.2	717	32	07 11	160	10.0	6.6	7.4	10.0	12.6	7.4	7.7	9.6	09.9
SISW1	48.3N	122.9W	711	30	1029.4	27 18	1005.6	05 22	1016.7	711	24	21 00	290	3.0	4.7	3.6	5.3	4.8	7.4	7.4	3.9	05.7
SJLF1	30.4N	081.4W	717	30	1023.2	23 15	1004.2	28 20	1016.4	717	36	28 15	130	11.8	10.8	14.1	11.3	12.4	6.4	5.9	9.8	13.1
SRST2	29.7N	094.1W	717	30	1026.3	30 14	1004.8	21 20	1017.0	717	27	02 13	190	9.2	11.0	11.2	11.7	11.0	7.1	2.3	3.0	10.5
STDM4	47.2N	087.2W	716	30	1029.2	26 18	1000.5	20 03	1017.4	716	33	25 22	330	13.3	11.2	13.0	14.7	10.6	13.5	15.5	17.3	14.9
TTIW1	48.3N	124.7W	715	30	1027.5	27 17	1005.6	11 13	1016.0	715	35	14 17	070	4.3	10.8	14.2	6.6	11.7	8.3	10.6	8.0	11.4
WPOW1	47.7N	122.4W	715	30	1028.6	27 17	1005.7	05 21	1016.6	716	23	06 03	190	7.3	6.1	2.4	4.2	9.1	4.3	2.6	2.3	06.9

SEPTEMBER 1984			WAVE HEIGHTS (METERS)					FREQUENCY OF WAVE HEIGHTS (%)							
BUOY#	LAT	LONG	OBS	MAX	SY	HR	MEAN	<1M	1-1.5M	2-2.5M	3-3.5M	4-5.5M	6-7.5M	8-9.5M	>9.5M
410011	34.9N	072.9W	527	4.5	15	75	1.8	1.5	43.0	45.1	9.2	0.9			
410021	32.3N	075.3W	717	5.0	29	72	2.0	4.6	77.5	73.4	21.8	2.6			
410061	29.3N	077.3W	648	6.5	08	15	1.9	18.9	26.3	25.6	23.7	4.3	0.9		
420011	25.9N	089.7W	604	3.0	24	11	1.3	13.8	60.6	25.7	0.2				
420021	26.0N	093.5W	427	3.0	02	76	1.4	2.3	69.0	28.3	0.2				
420031	26.0N	085.9W	702	2.5	17	71	1.0	47.2	39.7	12.9					
420071	30.1N	088.9W	492	2.0	07	16	7.9	38.4	56.0	5.4					
440051	42.7N	069.3W	035	2.0	02	04	1.1	20.0	60.0	20.0					
440071	43.5N	070.1W	578	1.5	10	02	0.6	70.7	29.2						
440081	40.5N	069.4W	702	5.0	15	19	1.1	23.3	66.5	8.9	0.9	0.1			
440101	36.9N	075.7W	714	3.0	30	70	1.1	23.1	63.5	12.1	1.1				
440111	41.1N	066.6W	715	6.0	15	22	1.4	7.4	69.0	20.4	2.5	0.9	0.1		
450011	48.0N	087.6W	367	3.0	07	16	7.9	40.5	50.1	7.6	1.6				
450031	45.3N	082.8W	665	4.0	26	73	1.0	36.3	49.4	11.4	2.5	0.1			
450061	47.2N	086.5W	676	3.0	26	75	7.9	42.4	50.7	6.6	0.1				
450251	41.7N	082.5W	539	1.5	04	70	7.6	69.9	30.0						
450261	47.3N	090.0W	648	3.0	24	72	7.9	33.6	61.4	4.9	0.1				
450271	42.7N	087.1W	698	7.5	07	15	1.0	38.9	47.3	12.0	1.5				
450281	44.3N	082.4W	688	3.0	26	75	1.0	33.9	57.0	8.2	0.7				
460011	56.3N	148.3W	715	4.0	14	71	7.1	0.5	38.1	39.0	17.6	4.3	0.2		
460041	51.0N	136.5W	716	6.0	19	71	7.5		12.0	53.6	26.6	7.5	0.1		
460051	46.1N	131.0W	716	4.5	23	09	1.9		40.9	49.5	9.3	1.1			
460061	40.7N	137.7W	714	4.5	17	22	1.7		46.8	50.2	2.5	0.2			
460101	46.2N	124.2W	676	3.5	20	72	1.5	6.6	60.9	30.0	2.3				
460111	34.9N	120.9W	396	3.5	22	72	1.7		56.0	40.1	3.7				
460121	37.4N	122.7W	699	3.0	07	04	1.5	0.4	60.6	33.6	1.2				
460131	38.2N	123.3W	715	4.0	21	10	1.9	3.1	48.5	35.3	10.9	0.9			
460141	39.2N	124.0W	700	4.0	21	23	1.7	6.2	46.7	32.1	12.4	0.9			
460231	34.3N	120.7W	711	3.5	22	03	1.7		55.4	41.0	3.5				
460241	32.8N	119.5W	711	3.5	21	11	1.6		59.0	36.8	4.0				
460251	33.6N	119.7W	715	3.0	21	72	7.9	28.5	65.5	5.3	0.5				
460261	37.6N	122.7W	717	2.5	12	08	1.2	4.8	79.2	15.8					
460281	35.8N	121.7W	716	4.0	21	20	7.0		19.1	48.3	12.1	0.4			
463291	46.2N	124.2W	713	3.0	20	16	1.5	5.4	60.1	31.2	3.0				
510011	23.4N	162.3W	315	2.5	09	13	1.5		73.6	26.3					
510321	17.2N	157.8W	572	2.5	28	01	1.6		60.8	39.1					
CHLY21	36.9N	075.7W	691	2.5	27	73	7.0	43.4	48.9	7.6					
FFIS11	32.7N	079.9W	123	0.0	00	00	0.0								10.5

SEPTEMBER 1984			TOTAL FREQUENCY OF WIND SPEEDS (%)							TOTAL FREQUENCY OF WIND DIRECTIONS (%)							
BUOY#	LAT	LONG	CALM	1-3KT	4-10KT	11-21KT	22-33KT	34-47KT	>47KT	N	NE	E	SE	S	SW	W	NW
410011	34.9N	072.9W		2.3	17.2	62.6	21.4	0.4		19.2	21.2	9.6	5.9	15.1	16.3	7.8	4.9
410321	32.3N	075.3W		3.8	27.5	58.4	10.3			8.5	27.5	20.0	9.2	15.8	12.6	2.5	3.9
410061	29.3N	077.3W		6.5	27.8	59.0	6.3	0.5		3.0	36.7	20.1	7.2	13.1	13.6	4.5	1.7
420311	25.9N	089.7W		0.5	16.8	76.5	6.3			15.1	20.6	40.4	20.5	1.1	0.6	1.4	0.4
420021	26.0N	093.5W		2.9	21.9	73.8	1.9			6.6	25.4	36.0	19.9	7.8	2.9	1.1	0.4
420231	26.0N	085.9W		2.5	37.5	60.7	7.4			8.6	27.4	40.4	9.1	2.3	1.0	0.9	0.9
420071	30.1N	088.9W		5.1	41.4	53.3	0.3			11.6	25.4	34.6	9.2	7.1	9.7	6.1	6.1
420091	29.3N	087.5W		10.8	34.1	47.5	7.6			13.9	24.0	15.0	1.6	2.4	5.8	7.4	10.0
440341	38.5N	070.7W		2.1	17.9	66.9	11.5	0.4		16.4	23.8	9.5	4.5	8.2	17.9	12.3	7.5
440351	42.7N	068.3W		2.9	31.4	65.7				7.9						25.7	66.4
440371	43.5N	070.1W		10.6	47.5	42.2				9.6	4.6	2.3	3.0	22.8	22.3	12.3	23.0
440741	40.5N	069.4W		7.1	40.7	43.2				21.3	16.9	7.2	5.9	12.8	13.7	11.6	10.6
440791	38.5N	074.6W	2.3	3.0	46.1	45.6	3.3			20.9	18.6	12.3	9.7	14.2	15.1	5.5	5.8
440101	36.9N	075.7W		9.4	39.5	43.2	8.0			20.5	26.2	17.2	6.0	10.2	13.7	2.5	3.7
440111	41.1N	066.6W		9.1	39.7	50.8	0.4			29.2	15.1	2.7	2.1	5.4	16.9	10.6	18.0
440121	38.8N	074.6W	2.7	4.8	45.5	44.0	3.7			10.6	17.6	21.4	13.4	12.6	16.8	4.6	2.7
440131	42.6N	070.9W	3.2	4.6	47.4	44.8	0.6			12.6	8.7	3.9	9.7	16.5	19.0	10.5	19.1
450011	48.0N	087.6W		7.9	74.4	17.7				4.0	15.5	6.6	13.4	10.8	20.4	18.1	9.2
450321	45.3N	086.2W		2.2	72.7	21.3	3.8			13.6	3.7	6.6	4.9	16.7	26.9	12.9	14.8
450331	45.3N	087.8W		8.1	43.0	48.6	2.4			8.9	8.1	8.1	5.8	21.7	15.6	12.3	19.5
450341	47.2N	086.5W		7.1	47.7	45.2				7.0	2.8	4.2	12.8	16.5	19.2	18.4	19.2
450351	41.7N	082.5W		23.7	67.0	9.3				16.7	15.0	7.2	7.1	10.0	22.9	8.6	8.4
450361	47.3N	090.0W		8.3	47.8	43.9				8.3	9.5	7.9	9.0	6.5	22.0	23.9	12.8
450371	42.7N	087.1W		6.2	41.6	50.0	2.2			12.6	7.5	5.9	14.1	25.0	10.8	8.4	15.7
450381	44.3N	082.4W		10.1	50.8	38.4	0.7			14.5	5.9	5.0	7.1	28.1	13.7	9.5	16.1
460011	56.3N	148.3W		3.8	47.2	45.8	3.2			10.6	8.7	13.4	19.6	9.4	10.3	14.9	13.2
460021	42.5N	130.3W		3.7	56.8	36.8	0.7			25.7	5.3	1.4	4.3	10.3	18.0	18.0	24.7
460031	51.9N	155.7W		0.7	24.1	66.3	8.7	0.1		5.7	5.3	3.4	12.2	16.1	17.0	18.0	22.2
460041	51.0N	136.0W		2.2	24.3	71.1	2.4			1.9	0.2	1.6	19.3	22.0	20.7	20.3	14.1
460051	46.1N	131.0W		2.5	26.7	62.0	6.8			14.3	3.7	4.6	8.2	11.7	13.1	19.0	25.6
460061	40.7N	137.7W		3.9	13.4	61.3	1.4			7.5	7.1	5.7	8.9	11.7	19.1	24.4	15.6
460101	46.2N	124.2W		14.6	44.9	40.2	7.3			16.9	5.6	12.7	4.6	22.4	10.6	8.7	18.5
460111	34.9N	120.9W		12.5	37.3	27.6	2.3			16.6	2.5	1.2	3.6	2.1	2.6	7.5	63.8
460121	37.4N	122.7W		6.7	50.6	41.6	1.1			26.3	1.4	0.7	0.2	1.2	1.2	9.0	60.1
460131	38.2N	123.3W		8.0	76.4	13.7	9.9			3.6	0.7	0.3	0.2	0.5	1.6	5.4	87.7
460141	39.2N	124.0W		4.7	40.7	37.9	16.8			21.0	0.7	0.7	0.1	3.5	1.2	1.4	67.4
460161	63.3N	170.3W		4.2	24.0	59.4	12.5			2.9	22.7	27.1	19.5	7.8	16.1	2.9	1.0
460171	60.3N	172.5W		2.5	15.4	69.5	12.6			2.1	23.7	23.5	21.7	11.7	11.7	10.9	3.8
460181	60.3N	177.0W			8.3	68.1	23.6			5.6	21.9	40.3	18.8	5.9	7.6		
460221	40.8N	124.5W		10.4	55.3	30.5	3.7			66.3	6.1	2.1	3.1	6.9	4.6	0.4	10.5
460231	34.3N	120.7W		5.5	26.1	46.5	19.8			16.5	0.6	2.6	3.1	1.7	2.2	4.6	68.4
460241	32.8N	119.5W		7.9	52.4	37.6	2.2			1.7	1.7	9.4	6.4	2.4	3.7	29.7	44.9
460251	33.6N	119.7W		23.0	68.5	8.3	0.1			2.3	2.7	5.9	9.8	10.3	11.7	42.7	14.7
460261	37.8N	122.7W		15.7	48.1	36.2				2.2	1.4	0.9	0.8	2.6	10.7	44.7	36.7
460271	41.8N	124.4W	11.3	19.0	37.1	31.4	12.6			9.0	5.3	6.2	13.7	2.1	0.4	8.9	54.4
460291	35.8N	121.7W		6.6	41.0	44.1	8.3			0.8	1.2	0.1	1.3	0.3	0.8	11.7	83.8
463291	46.2N	124.2W		18.9	45.1	35.9	0.1			17.0	8.7	12.2	4.6	23.5	9.2	7.7	17.2
463311	55.5N	161.7W		33.3	51.9	11.1	3.7			37.0	9.3			20.4	27.8	3.7	1.9
480121	54.4N	165.4W			57.0	12.0	5.0			7.0	5.0	8.2	26.0	14.0	4.0	15.0	21.0
480131	55.8N	159.8W			70.4	25.9	3.7			26.9	34.3	7.4	3.7		11.1		16.7
480341	55.1N	167.1W			50.0	35.7	14.3			12.5	4.5		53.6	10.7		5.4	13.4
510211	23.4N	162.3W		6.3	71.7	22.0				0.4	7.6	71.6	16.0	2.9	1.2	0.1	0.2
510321	17.2N	157.8W		0.7	36.5	63.2	0.2				7.9	91.8	0.3				
BURL1	28.9N	088.4W	3.2	13.5	28.0	44.5	12.9			18.5	25.0	24.1	8.4	7.9	4.0	2.3	9.9
CAPV1	43.1N	124.4W	9.2	32.1	46.7	20.0	1.0			24.3	27.1	12.6	6.3	12.3	14.4	1.7	1.2
CHLV1	36.9N	075.7W	1.1	3.8	32.0	58.6	15.3	0.3		7.4	29.3	30.7	11.6	6.9	10.8	11.8	1.5
CSBF1	29.7N	085.4W	3.6	28.3	69.0	2.6				11.8	21.3	32.0	1.4	5.0	6.1	13.0	7.4
DRLM1	42.6N	079.5W	2.7	17.2	51.4	18.5	3.0			10.8	6.9	5.5	15.6	26.2	13.8	8.7	12.6
DPSA1	47.7N	124.5W	4.6	19.6	51.7	24.1	0.7			6.9	11.9	14.7	20.5	16.3	6.8	6.8	16.0
DPSI1	47.1N	089.7W	2.0	7.1	42.1	46.8	2.7			10.8	8.2	6.5	7.8	13.3	20.1	13.7	9.4
FBIS11	32.7N	079.9W	2.0	12.6	47.6	43.3	4.5			11.8	39.5	15.7	5.7	2.8	10.1	5.6	8.0
FFIA21	27.3N	133.6W	13.7	28.6	44.5	14.1	2.6			23.2	20.6	6.7	19.2	8.9	2.4	5.6	3.3
GLLM1	43.5N	076.7W	2.1	11.2	42.7	42.5	3.6			8.0	13.3	4.3	5.3	24.0	15.2	16.5	13.3
IOSN1	42.9N	077.9W	1.3	8.0	42.1	45.2	4.7			11.0	6.0	5.4	10.0	17.1	16.3	14.3	19.7
LKFI1	46.7N	087.7W	2.2	13.7	74.2	46.5	5.4			7.1	16.8	13.2	10.9	9.0	8.3	7.9	4.9
MDRM1	44.0N	069.1W	2.2	7.9	73.3	12.0	0.7			7.6	6.0	1.4	4.1	14.3	22.9	20.2	23.4
MISM1	43.8N	068.9W	3.6	11.1	79.1	10.9	0.9			15.3	6.3	4.2	7.3	12.3	18.0	21.2	15.2
NAPO1	44.6N	124.1W	9.5	20.3	57.3	16.7	0.7			25.2	7.6	23.3	1.6	19.1	11.3	2.8	9.1
PTLM1	48.2N	088.4W	1.4	6.6	71.6	51.1	18.5			6.2	13.3	9.0	8.9	12.1	18.4	16.9	13.1
PTAT21	77.8N	170.8W	0.6	1.6	29.7	64.2	3.6			27.8	19.6	21.9	22.2	3.1	2.1	0.6	2.6
PTGC1	34.6N	120.7W	4.5	12.7	73.5	44.6	9.9			82.3	2.3	2.4	4.8	7.0	0.7	1.0	3.5
RCAM1	47.9N	088.3W	2.5	7.1	23.9	56.7	14.2			12.9	17.2	5.1	10.9	3.8	22.0	20.8	12.3
STDI1	41.7N	087.9W	2.2	13.6	52.4	12.2	1.7	0.1		13.2	11.2	6.4	10.3	25.5	15.6	7.5	10.4
STMI1	43.8N	087.7W	4.0	11.7	47.4	36.7	4.2			11.9	6.5	4.7	11.2	30.8	11.3	12.2	13.5
STSI1	48.3N	122.9W	10.0	31.9	55.6	12.0	0.3			5.5	7.1	6.6	10.8	15.0	15.9	27.0	12.0
SJLF1	30.4N	081.4W	0.6	6.1	76.9	13.9	2.1	0.1		3.8	29.5	20.5	11.5	5.4	6.7	6.9	6.8
SPST2	29.7N	094.1W	1.3	5.6	46.7	43.3	2.4			17.5	26.8	6.2	24.9	19.6	2.3	0.2	2.8
STDM1	47.2N	087.2W	0.8	4.1	22.3	57.8	16.0			19.8	8.8	6.7	9.0	15.2	11.1	19.6	10.9
TTIX1	48.3N	124.7W	2.2	9.5	38.7	43.8	7.8	0.1		0.4	16.2	20.0	6.3	26.6	10.1	8.9	1.6
WPOW1	47.7N	127.4W	0.5	23.5	58.2	17.7	0.6			22.4	28.0	1.4	11.9	30.9	3.8	1.4	0.1

SEPTEMBER 1984			% FREQUENCY OF WIND SPEEDS (<4 KTS)								% FREQUENCY OF WIND SPEEDS (4-10 KTS)								% FREQUENCY OF WIND SPEEDS (11-21 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W		0.4	0.1	0.7	0.7	0.5	0.1	0.2	3.6	1.3		<.05	1.2	2.0	2.3	2.7	8.9	14.0	6.9	3.2	12.6	12.0	3.4	1.8
41002	32.3N	075.2W	0.6	0.7	0.5		0.2	0.4	1.0	0.4	4.5	7.4	6.5	1.8	1.7	4.1	0.4	1.2	3.2	16.2	9.3	7.0	13.0	7.1	0.6	1.9
41006	29.3N	077.3W	0.2	0.2	1.0	1.5	2.1	0.9	0.3	0.4	2.4	4.6	3.7	2.9	3.6	7.2	2.3	1.1	0.4	26.9	14.5	2.8	6.9	5.2	1.9	0.2
42001	25.9N	089.7W			0.2	0.1		0.3			2.2	2.1	5.9	4.4	0.6	0.1	1.4	0.1	11.9	18.0	29.9	18.0	0.4	0.3		0.3
42002	26.0N	093.5W		0.5	0.9	0.2		0.3	0.2	0.2	1.8	1.7	7.7	5.8	2.3	1.6	0.9	0.1	4.8	23.1	26.3	13.2	5.4	1.1		
42003	26.0N	085.9W	0.5	1.0	0.9	0.5	0.4	0.4	0.2	0.4	2.7	9.7	10.8	4.1	1.0	0.5	0.5	0.3	5.4	16.4	23.2	4.3	0.9	0.1	0.1	0.3
42007	30.1N	088.9W	0.1	<.05	0.2	0.5	0.2	1.5	1.1	1.4	5.7	4.2	4.9	2.4	6.6	8.1	4.9	4.8	5.8	20.9	19.5	6.3	0.3	0.1	0.1	0.2
42009	29.3N	087.5W	1.8	0.4	1.3	1.0	1.9	1.6	1.8	0.9	6.6	4.7	4.6	0.1	0.4	4.3	5.6	7.7	5.5	14.9	25.4	0.3				1.3
44004	38.5N	070.7W	0.1	0.3		0.3	0.1	0.1	0.9	0.2		1.7	2.1	0.6	2.3	6.3	3.8	1.1	13.9	16.9	5.7	3.0	5.5	11.3	6.9	5.7
44005	42.7N	068.3W							2.1	0.7	7.9						2.1	21.4							21.4	44.3
44007	43.5N	070.1W	1.2	1.4	1.4	0.9	0.9	1.2	1.9	1.7	5.0	1.7	1.0	2.0	6.8	9.2	7.3	14.3	3.5	1.6		<.05	15.0	12.0	3.1	7.0
44008	40.5N	069.4W	1.1	1.1	0.4	1.1	0.7	0.1	0.6	1.9	10.1	5.9	1.9	4.3	7.9	5.0	8.1	6.4	10.1	9.8	4.9	0.6	4.1	8.6	2.8	2.3
44009	38.5N	074.6W	0.3	0.2	0.2	1.4		0.2	0.6	0.3	6.0	5.6	8.6	6.9	9.2	5.2	1.5	3.1	11.0	10.8	3.6	1.8	5.0	9.0	1.4	1.9
44010	36.9N	075.7W	0.6	0.3	0.8	0.6	1.1	0.8	0.5	0.7	4.5	6.1	9.2	3.8	5.4	7.3	2.0	1.2	14.6	18.6	7.2	1.5	3.8	5.6	0.1	1.7
44011	41.1N	066.6W	1.0	0.9	0.5	0.7	1.5	1.6	1.1	1.8	7.7	3.8	0.4	0.6	3.4	10.0	5.9	7.8	20.3	10.3	1.8	0.7	0.5	5.3	3.6	8.3
44012	38.8N	074.6W	0.3	1.9	1.3	0.6	0.1	0.3		0.3	4.1	3.7	6.5	10.0	9.5	7.7	2.6	1.4	5.4	9.9	11.8	2.9	2.9	0.9	2.0	1.0
44013	42.4N	070.8W	0.5	0.2	0.6	0.6	0.9	1.5	1.7	0.6	7.6	5.4	3.3	7.1	9.1	11.7	7.5	8.7	4.1	3.0		2.0	6.5	5.9	1.3	9.7
45001	48.0N	087.6W	1.3	1.3	1.0	0.8	0.8	1.0	0.7	1.0	2.6	14.0	7.4	6.0	6.9	10.1	11.3	8.1		0.3	0.2	6.7	3.1	1.3	6.0	0.1
45002	45.3N	086.3W		0.3	0.2	<.05	0.2	0.7	0.1	0.6	4.3	1.3	1.9	1.7	2.4	7.9	7.4	5.8	9.3	2.1	4.8	3.1	12.0	17.4	4.9	7.9
45003	45.3N	082.8W	0.5	0.5	1.2	0.8	0.4	1.0	1.4	0.3	6.4	3.8	2.8	1.2	4.5	8.4	7.4	8.4	2.8	3.3	3.9	3.7	16.3	6.2	3.3	9.8
45004	47.2N	086.5W	0.7	0.4	1.0	0.9	0.8	1.5	1.2	0.7	4.7	1.7	1.4	2.8	7.8	11.7	8.8	8.7	1.6	0.7	1.8	9.1	7.9	5.9	8.4	9.8
45005	41.7N	082.5W	5.6	3.3	2.9	4.3	7.8	4.7	1.8	3.4	11.1	6.7	4.3	2.8	11.2	10.2	6.7	4.8							0.1	0.2
45006	47.3N	090.0W	0.9	1.4	1.4	1.0	0.9	1.1	1.1	0.5	6.0	3.5	2.6	3.9	4.4	9.5	9.7	8.2	1.6	4.6	3.9	4.1	1.2	11.4	13.1	4.1
45007	42.7N	087.1W	1.1	0.4	0.8	0.6	0.6	0.6	1.1	0.8	4.6	4.7	2.4	4.9	8.1	6.1	5.3	5.6	6.9	2.2	2.8	8.2	15.3	4.2	1.9	8.6
45008	44.3N	082.4W	0.5	1.4	0.9	0.7	1.9	1.5	1.7	1.6	10.9	3.2	3.0	4.1	8.4	6.9	5.3	8.9	3.1	1.4	1.1	2.2	17.6	5.3	2.4	5.3
46001	56.3N	148.3W	0.8	0.4	0.4	0.4	0.3	0.1	0.5	0.8	3.8	2.3	6.0	7.1	6.8	5.9	9.4	5.8	5.9	5.8	5.7	10.2	2.4	4.2	4.9	6.6
46002	42.5N	130.3W	0.6	0.8	0.3	0.7	1.2	0.5	0.4	0.1	6.4	0.6	0.9	3.2	3.4	11.2	5.8	6.3	18.7	1.9	0.2	0.4	3.6	2.7	11.8	17.6
46003	51.9N	155.7W	0.1				0.3	0.1	0.1	0.1	3.2	2.7	0.6	1.3	5.2	3.3	1.9	5.8	2.2	2.2	1.8	8.3	10.1	11.4	13.7	16.3
46004	51.0N	136.0W	0.1				0.4	0.9	0.4	0.4	1.5	0.2	0.6	3.2	3.9	3.9	4.3	6.6	0.2		1.0	13.9	17.4	15.9	15.6	7.1
46005	46.1N	131.0W	0.1	0.3	0.2	0.3	0.4	0.1	0.8	0.4	2.7	0.7	4.1	4.1	2.5	3.7	5.4	3.5	9.0	2.6	0.3	3.7	8.3	7.7	10.8	19.4
46006	40.7N	137.7W	0.2	<.05	0.6	0.1	0.5	1.0	0.9	0.5	3.2	4.3	2.4	4.4	2.7	3.9	7.4	5.0	4.1	2.7	2.1	4.4	8.2	10.0	15.9	9.9
46010	46.2N	124.2W	1.2	1.3	2.0	1.5	0.9	2.2	2.6	1.8	7.3	3.2	3.7	2.9	8.3	5.0	5.2	9.2	8.4	1.1	7.0	0.3	12.8	2.3	0.9	7.6
46011	34.9N	120.9W	3.0	0.7	0.7	1.8	0.6	1.6	1.3	3.2	12.0	1.8	0.5	1.8	1.4	1.0	5.7	32.9	1.6						0.5	25.8
46012	37.4N	122.7W	1.2	0.5	0.4	0.1	0.3	0.6	1.3	2.3	9.7	0.7	0.1	<.05	0.9	0.5	6.7	31.9	15.0	0.3	0.1			0.1	0.9	25.1
46013	38.2N	123.3W	1.0	0.7	0.1	0.2	0.4	0.4	1.8	3.4	2.4	<.05	0.1	<.05	0.1	0.9	3.6	31.2	0.2						0.3	43.2
46014	39.2N	124.0W	0.8	0.2	0.1	0.8	0.6	0.5	0.4	1.2	12.4	0.5	0.6	3.3	2.8	0.6	0.5	20.0	7.9					<.05	0.5	29.4
46016	63.3N	170.3W		1.0			2.1	0.3	0.8		1.8	4.7	7.8	0.5	5.7	3.4			1.0	0.6	19.3	15.9		11.5	2.1	1.8
46017	60.3N	172.3W	0.4	0.4		0.8		0.4	0.4		2.5	4.7	7.1	5.5	1.4	5.4	5.8	3.1	5.9	7.4	16.7	15.9	2.3	5.9	4.6	0.7
46018	60.3N	177.0W										0.3	5.9	2.1					1.4	10.8	26.7	14.6	4.9	1.7		
46022	40.8N	124.5W	3.6	1.7	1.6	1.2	0.5	0.6	0.1	1.0	30.8	4.3	0.5	1.7	2.5	2.4	0.2	4.9	21.5	0.1		0.1	3.9	1.7		3.2
46023	34.3N	120.7W	0.5	0.4	0.9	0.5	0.5	0.7	0.6	1.3	6.5	0.4	1.6	2.2	1.1	1.5	2.7	12.1	0.2		0.1	0.3	0.1		1.3	36.4
46024	32.8N	119.5W	0.3	0.9	0.5	0.7	1.3	1.4	1.6	1.4	1.4	0.8	7.4	4.3	1.1	2.3	17.4	17.6			1.6	1.4			9.7	24.8
46025	33.6N	119.0W	1.1	2.1	1.7	2.5	3.7	4.4	4.8	2.8	1.1	0.6	4.2	7.3	6.6	7.4	30.8	10.6							7.0	1.3
46026	37.8N	122.7W	1.6	0.6	0.6	0.8	1.3	2.9	4.3	3.7	0.7	0.5	0.3		1.0	7.1	24.1	14.4		0.3			0.2	0.7	16.3	18.7
46027	41.8N	124.4W	3.7	3.7	2.1	3.0	0.7	0.3	1.1	4.3	5.0	1.6	3.4	6.8	1.5	<.05	3.4	15.3	0.3		0.6	3.0			3.3	23.3
46028	35.8N	121.7W	0.3	1.1		0.1	0.3	0.7	1.4	2.8	0.5	0.1	0.1	1.2			7.3	31.8						0.1	2.9	41.1
46029	46.2N	124.2W	2.2	1.8	2.8	2.1	1.4	3.2	3.1	2.4	7.5	4.1	5.0	2.0	8.8	5.1	3.8	8.8	7.3	2.8	4.4	8.5	13.2	1.8	0.7	6.8
46031	55.5N	161.7W	2.8	8.3			7.4	11.1	3.7		19.4	0.9			13.0	16.7		1.9	11.1							
46032	54.2N	165.8W									7.0	5.0	8.0	22.0	14.0	4.0	15.0	5.0				4.0				8.0
46033	55.8N	159.8W									13.9	26.9	3.7	3.7		7.4		14.8	10.2	7.4	3.7			3.7		0.9
46034	55.1N	163.1W									6.3	3.6		21.4	10.7		5.4	2.7	2.7	0.9		32.1				
51001	23.4N	162.3W	0.1	1.1	1.3	1.1	1.6	0.9	0.1	0.1	0.2	6.0	49.6	10.1	1.4	0.4		<.05		0.6	20.7	0.8				
51002	17.2N	157.8W		<.05	0.1							5.2	31.1	0.2						2.7	60.4	0.1				
BURL1	28.9N	089.4W	0.5	2.7	1.3	3.6	4.0	1.7	0.3	0.4	4.9	3.0	5.4	4.5	3.9	2.4	1.8	2.2	11.3	11.0	14.4	0.2		0.3	0.1	7.1
CARO3	43.1N	124.4W	4.5	7.0	9.3	3.5	2.7	3.1	1.4	0.7	10.2	17.5	3.3	2.8	5.1	7.1	0.2	0.5	9.6	2.6			3.7	4.0		0.1
CHLV2	36.9N	075.7W	0.2	0.4	0.1	0.6	0.9	0.8	0.4		2.0	4.3	3.5	3.3	1.1	2.8	3.9	1.0	4.4	14.1	13.3	7.4	4.6	7.2	7.3	0.5
CSBF1	29.7N	085.4W	6.3	10.8	2.5	0.5	0.9	1.9	1.3	4.8	5.5	20.3	18.3	0.9	4.1	6.1	10.5	3.3		0.2	1.2			0.1	1.2	0.1
DBLN6	42.4N	079.3W	1.8	1.2	1.4	3.6	5.3	1.4	1.2	2.1	6.3	4.3	4.1	11.8	19.9	6.8	3.9	5.5	3.1	1.3		1.0	1.0	4.9	3.3	3.8
DESW1	47.7N	124.5W	2.4	1.1	3.2	3.4	2.4	1.6	2.8	2.6	4.4	9.2	7.3	8.8	6.3	4.8	3.7	7.2	2.1	1.6	0.2	8.2	7.6	0.4	0.3	7.7
DISW3	47.1N	090.7W	1.9	0.8	0.5	0.8	1.3	0.7	0.6	1.2	5.0	0.6	2.3	5.7	8.4	9.7	5.8	2.9	2.8	3.6	3.4	1.3	3.6	19.7	7.4	6.8
FBIS1	32.7N	079.9W	3.3	1.4	1.5	0.1	0.4	0.7	1.4	3.8	3.0	5.2	10.3	5.6	2.3	6.5	3.8	3.9	5.3	30.4	3.8		0.1	3.2		0.4
FFIA2	57.3N	133.6W	7.8	8.0	3.8	1.7	1.3	1.0	4.3	1.5	15.2	11.4	3.8	4.4	5.7	1.3	1.3	1.7	8.7	1.2	0.2	11.9	1.9	<.05		0.1
GLLN6	43.5N	076.3W	2.0	1.6	0.9	1.2	0.8	1.2	1.9	1.6	6.0	9.0	2.6	2.4	2.9	7.2	5.7	6.9		2.7	0.8	1.8	18.6	6.4	7.9	4.4
IOSN3	42.9N	070.6W	0.9	1.1	1.0		1.0	0.8	2.2	1.0	4.8	2.8	3.7	6.1	5.8	7.4	7.4	4.3	4.9	2.0	0.6	3.9	9.4	7.9	3.8	12.8
LKWF1	26.7N	080.0W	0.4	0.8	0.7	1.1	0.2	2.2	5.0	2.7	1.7	2.5	8.5	8.7	3.1	9.5	2.6	2.2	2.9	13.5	21.8	3.2	5.0	0.6	0.2	
MDRM1	44.0N	069.1W	1.0	2.0	0.8	0.7	0.5	0.4	1.2	1.3	2.5	1.7	0.6	2.9	3.0	5.8	10.0	6.8	3.1	1.3		0.5	8.4	15.4	0.7	14.5
MISM1	43.8N	068.9W	1.8	0.4	1.2	4.6	1.8	0.4	0.9		4.4	3.1	3.0	2.6	5.8	5.9	9.8	4.6	6.8	2.0		0.2	4.8	7.4	10.2	8.4
NWPO3	44.6N	124.1W	4.6	4.0	8.6	1.2	4.7	2.1	1.6	3.3	10.1	3.5	13.3	0.4	11.0	7.5	1.1	5.4	10.2		1.4		2.9	1.6	8.1	0.5
PILM4	48.2N	088.4W	2.3	0.5	0.4	0.8	0.9	0.7	0.4	0.9	5.9	5.7	2.5	1.7	3.1	5.1	2.2	5.3		6.3	3.9	3.7	7.4	11.6	12.0	6.0
PTAT2	27.8N	097.1W		0.2	0.8	<.05	0.3	0.1			3.2	3.9	8.8	6.8	1.2	1.9	0.5	0.9	21.8	10.8	12.3	19.9	1.6		0.1	1.7
PTGC1	34.6N	120.7W	4.2	0.1	0.4	2.5	2.5	0.7	0.9	1.3	25.3	0.1		2.0	4.3	<.05	0.1	1.5	43.0	<.05		0.3	0.1			0.4
ROAM4	47.9N	089.3W	0.4	1.3	0.7	0.9	0.1	1.5	1.5	0.7	5.6	4.8	1.0	1.3	1.3	4.3	2.3	4.1	6.8	4.7	2.8	6.1	2.0	11.2	14.3	6.8
SPID1	41.7N	082.8W	2.9	4.5	0.6	1.2	1.9	0.6	1.3	0.5	9.8	6.6	5.3	4.6	11.3	7.7	2.9	4.2	0.5		0.5	4.5	12.1	7.2	2.0	4.8
SGNW3	43.8N	087.7W	1.3	1.2	0.7	1.7	3.0	1.4	1.3	1.1	4.5	2.7	2.5	5.0	9.0	7.6	8.8	7.3	6.1	0.5	1.4	3.5	16.0	2.3	2.1	4.8
SISW1	48.3N	122.9W	3.1	2.7	3.2	2.7	5.3	3.4	5.6	5.9	2.2	3.7	3.5	7.5	9.4	8.7	15.3	5.6	0.1	0.7		0.6	0.4	3.9	5.9	0.4
SJLF1	30.4N	081.4W	1.0	0.8	0.6	0.1	0.3	0.2	2.3	0.8	1.0	3.2	6.6	6.0	2.2	6.1	5.7	4.2	0.9	15.5	16.3	3.8	2.3	0.3	1.0	3.8
SRST2	29.7N	094.1W	1.6	0.8	0.6	0.9	0.3	0.4	0.1	1.2	0.9	10.2	1.7	8.9	7.9	1.4	0.1	1.6	6.9	15.4	3.8	15.4	11.3	0.5		
STDM4	47.2N	087.2W	0.3	0.7	1.1	0.8	0.5	0.4	0.2	0.1	5.9	3.1	0.8	2.4	2.2	3.1	4.1	0.8	11.6	4.5	3.9	3.3	6.0	6.8	13.2	7.6
TTIW1	48.3N	124.7W	0.1	2.3	1.4	1.3	0.8	1.9	1.2	0.4	8.3	5.9	8.1	3.5	11.8	8.5	2.8	8.8		7.8	15.3	1.4	12.1	2.7	4.9	0.4
WPOW1	47.7N	122.4W	4.4	7.1	1.8	4.7	3.3	1.9	0.9	0.1	14.3	17.1	0.5	6.7	17.5	1.7	0.5		3.7	3.8		0.5	9.5	0.2		

SEPTEMBER 1984			% FREQUENCY OF WIND SPEEDS (22- 33 KTS)								% FREQUENCY OF WIND SPEEDS (34-47 KTS)								% FREQUENCY OF WIND SPEEDS (>47 KTS)							
BUOY	LAT	LONG	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW	N	NE	E	SE	S	SW	W	NW
41001	34.9N	072.9W	6.8	5.4	2.6	2.9	0.6	1.4	2.0	0.2						0.4										
41002	32.3N	075.2W	0.2	7.2	3.7	0.5	0.8	1.0	0.5	0.4																
41006	29.3N	077.3W		4.6	0.9		0.6	0.2				0.8														
42001	25.9N	089.7W	1.0	0.6	4.4	0.3																				
42002	26.0N	093.5W		0.1	1.0	0.6	0.2																			
42003	26.0N	085.9W		0.7	6.5	0.3																				
42007	30.1N	088.9W		0.2	0.1																					
42009	29.3N	087.5W		2.9	3.6	0.1																				
44004	38.5N	070.7W	2.2	4.9	1.5	0.5	0.2	0.2	0.6	0.3	0.1		0.1					0.1								
44005	42.7N	068.3W																								
44007	43.5N	070.1W																								
44008	40.5N	069.4W																								
44009	38.5N	074.6W	2.8	2.0						0.5																
44010	36.9N	075.7W	0.8	1.1																						
44011	41.1N	066.6W	0.2	0.1						0.1																
44012	38.8N	074.6W	1.0	2.2	2.5																					
44013	42.4N	070.8W	0.4	0.2																						
45001	48.0N	087.6W																								
45002	45.3N	086.3W					2.0	0.4	0.5	0.5																
45003	45.3N	082.8W		0.5	0.2	0.1	0.5		0.1	1.0																
45004	47.2N	086.5W																								
45005	41.7N	082.5W																								
45006	47.3N	090.0W																								
45007	42.7N	087.1W				0.4	1.0		0.1	0.7																
45008	44.3N	082.4W				<.05	0.2		0.1	0.3																
46001	56.3N	148.3W		0.1	1.3	1.9																				
46002	42.5N	130.3W								0.7																
46003	51.9N	155.7W	0.1	0.5	0.9	2.6	0.4	1.9	2.3						0.1	<.05										
46004	51.0N	136.0W				2.1	0.2																			
46005	46.1N	131.0W	2.5			<.05	0.5	1.6	2.3	1.9																
46006	40.7N	137.7W		<.05	0.5		0.3	0.2	0.1	0.1																
46010	46.2N	124.2W					0.3																			
46011	34.9N	120.9W								2.3																
46012	37.4N	122.7W	0.4							0.7																
46013	38.2N	123.3W								9.9																
46014	39.2N	124.0W								16.8																
46016	63.3N	170.3W		8.3		3.1		1.0																		
46017	60.3N	172.3W	1.3			1.3																				
46018	60.3N	177.0W	4.2	2.4	7.6	2.1	1.0	5.4																		
46022	40.8N	124.5W	2.4							1.3																
46023	34.3N	120.7W	1.3							18.5																
46024	32.8N	119.5W							1.0	1.2																
46025	33.6N	119.0W							0.1																	
46026	37.8N	122.7W																								
46027	41.8N	124.4W							1.0	11.5																
46028	35.8N	121.7W							0.1	8.2																
46029	46.2N	124.2W				<.05	0.1																			
46031	55.5N	161.7W	3.7																							
46032	54.2N	165.8W								8.0																
46033	55.8N	159.8W	2.8							0.9																
46034	55.1N	163.1W	3.6							10.7																
51001	23.4N	162.3W																								
51002	17.2N	157.8W			0.2																					
BURL1	28.9N	089.4W	1.8	0.8	3.1	0.1				0.2																
CARO3	43.1N	124.4W					0.7	0.2																		
CHLV2	36.9N	075.7W	0.8	9.8	3.8	0.4	0.2	<.05	0.2			0.3														
CSBF1	29.7N	085.4W																								
DBLN6	42.4N	079.3W	0.4	0.2				1.0	0.3	1.1																
DESW1	47.7N	124.5W				0.1				0.6																
DISW3	47.1N	090.7W	1.2	3.4	0.7				0.2	0.2																
FBIS1	32.7N	079.9W		2.5																						
FFIA2	57.3N	133.6W	1.5			1.3																				
GLLN6	43.5N	076.3W					1.8	0.5	1.1	0.3																
IOSN3	42.9N	070.6W	0.3	0.4	0.3		0.9	0.1	0.8	1.8																
LKWF1	26.7N	080.0W	2.0	1.9	0.7	0.2	0.6																			
MDRM1	44.0N	069.1W	0.9	1.0			2.4	1.3	0.3	0.7																
MISM1	43.8N	068.9W	2.3					4.1	0.3	2.1																
NWPO3	44.6N	124.1W	0.1				0.5	0.1																		
PILM4	48.2N	088.4W		0.9	2.2	2.7	0.7	3.9	2.3	0.8																
PTAT2	27.8N	097.1W	2.8	0.3	0.1	0.5																				
PTGC1	34.6N	120.7W	9.7							0.2																
ROAM4	47.9N	089.3W	0.1	2.1	0.5	2.6	0.5	5.0	2.7	0.7																
SPID1	41.7N	082.8W					0.1	<.05	0.5	1.0								0.1								
SGNW3	43.8N	087.7W		0.1		0.9	2.7		0.1	0.3																
SISW1	48.3N	122.9W							0.2	0.1																
SJLF1	30.4N	081.4W	0.8	9.9	3.1	0.5	0.6							0.1												
SRST2	29.7N	094.1W		0.1		0.1	0.1																			
STDM4	47.2N	087.2W	1.0	0.5	0.9	2.5	6.4	0.7	2.2	2.4																
TTIW1	48.3N	124.7W		0.9	5.8		1.9	0.1				<.05	0.1													
WPOW1	47.7N	122.4W					0.4																			

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